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Certain publications abstracted in *STAR* are given analytic treatment, with citations and abstracts of daughter items following immediately after the parent document. When the subject content of a daughter differs from that of its parent, a cross-reference citation is printed at the end of the category to which the daughter would normally have been assigned.

Five indexes are included in each issue: subject, personal author, corporate source, contract number, and report/accession number. Cumulative index volumes are published semiannually and annually.

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IAA is available on subscription from the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, NY 10017, at the following annual rates:

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The Preliminary Edition of the *NASA Thesaurus* (December 1967) (NASA SP-7030) is used as the authority for the indexing vocabulary that appears in the subject index. The *NASA Thesaurus* should be consulted in examining the current indexing vocabulary, including associated cross-reference structure. Only the subject terms that have been selected to describe the documents abstracted in this issue appear in the subject index. Copies of the *NASA Thesaurus* may be obtained from the National Technical Information Service or the U.S. Government Printing Office at $8.50 for the three-volume set. The first two volumes of this Thesaurus, consisting of the alphabetical listing of subject terms (A–Z), have been superseded by the following single-volume publication: *NASA Thesaurus Alphabetical Update* (September 1971) (NASA SP-7040), available from NTIS for $6.00. (Volume III of the Preliminary Edition consists of the following ancillary aids to vocabulary selection: heirarchical display of index terms, category term listing, permuted index, and a listing of postable terms only.)

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02 Aircraft 2504
Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc.; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

03 Auxiliary Systems 2507
Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines; hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems.

04 Biosciences 2508
Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

05 Biotechnology 2516
Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

06 Chemistry 2521
Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

07 Communications 2525
Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

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08 Computers 2530
Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

09 Electronic Equipment 2534
Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors, integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

10 Electronics 2536
Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

11 Facilities, Research and Support 2539
Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

12 Fluid Mechanics 2541
Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

13 Geophysics 2545
Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

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18 Materials, Nonmetallic 2578
Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

19 Mathematics 2581
Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

20 Meteorology 2584
Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

21 Navigation 2591
Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

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Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

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Includes acoustics, Cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology, and 29 Space Radiation.

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28 Propulsion Systems 2607
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29 Space Radiation 2609
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30 Space Sciences 2611
Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbits and trajectories. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

31 Space Vehicles 2618
Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

32 Structural Mechanics 2621
Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

33 Thermodynamics and Combustion 2624
Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

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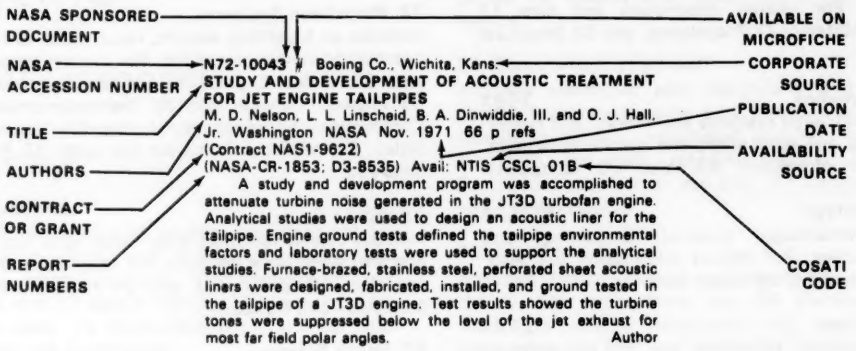
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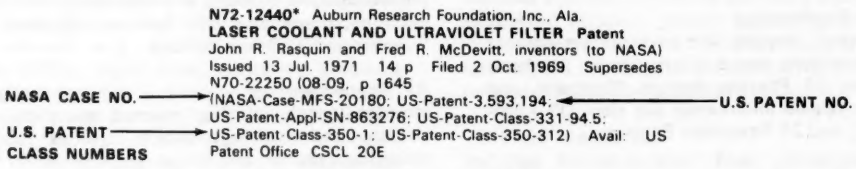
N72-10043 # Boeing Co., Wichita, Kans.
STUDY AND DEVELOPMENT OF ACOUSTIC TREATMENT FOR JET ENGINE TAILPIPES
M. D. Nelson, L. L. Linscheid, B. A. Dinwiddie, III, and O. J. Hall, Jr. Washington NASA Nov. 1971 66 p refs
(Contract NAS1-9622)
(NASA-CR-1853; D3-8535) Avail: NTIS CSCL 01B
A study and development program was accomplished to attenuate turbine noise generated in the JT3D turbofan engine. Analytical studies were used to design an acoustic liner for the tailpipe. Engine ground tests defined the tailpipe environmental factors and laboratory tests were used to support the analytical studies. Furnace-brazed, stainless steel, perforated sheet acoustic liners were designed, fabricated, installed, and ground tested in the tailpipe of a JT3D engine. Test results showed the turbine tones were suppressed below the level of the jet exhaust for most far field polar angles. Author

PATENT CITATION


NASA CASE NO.
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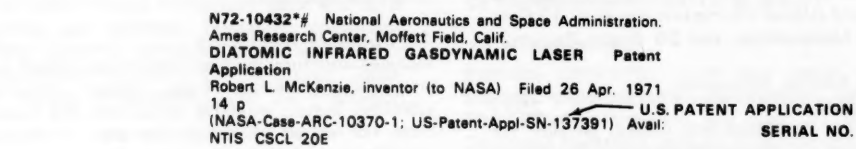
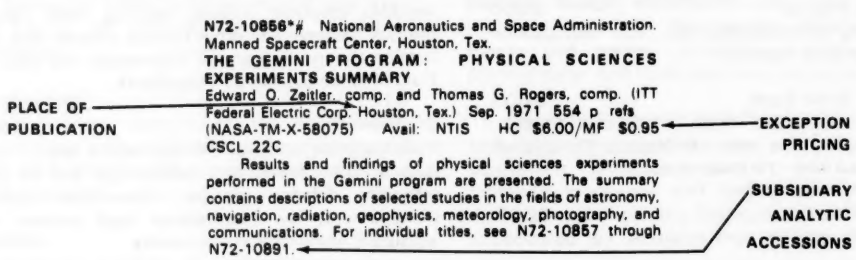
LASER COOLANT AND ULTRAVIOLET FILTER Patent
John R. Rasquin and Fred R. McDevitt, inventors (to NASA)
Issued 13 Jul. 1971 14 p Filed 2 Oct. 1969 Supersedes N70-22250 (08-09, p 1645
(NASA-Case-MFS-20180; US-Patent-3,593,194; US-Patent-Appl-SN-863276; US-Patent-Class-331-94.5; US-Patent-Class-350-1; US-Patent-Class-350-312) Avail: US Patent Office CSCL 20E

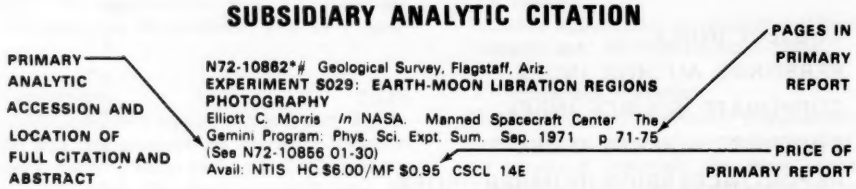
PATENT APPLICATION CITATION


U.S. PATENT APPLICATION SERIAL NO.
N72-10432*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIATOMIC INFRARED GASDYNAMIC LASER Patent Application
Robert L. McKenzie, inventor (to NASA) Filed 26 Apr. 1971 14 p
(NASA-Case-ARC-10370-1; US-Patent-Appl-SN-137391) Avail: NTIS CSCL 20E

PRIMARY ANALYTIC CITATION AND ABSTRACT


PLACE OF PUBLICATION
EXCEPTION PRICING
SUBSIDIARY ANALYTIC ACCESSIONS
N72-10856*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
THE GEMINI PROGRAM: PHYSICAL SCIENCES EXPERIMENTS SUMMARY
Edward O. Zeitler, comp. and Thomas G. Rogers, comp. (ITT Federal Electric Corp., Houston, Tex.) Sep. 1971 554 p refs
(NASA-TM-X-58075) Avail: NTIS HC $6.00/MF $0.95 CSCL 22C
Results and findings of physical sciences experiments performed in the Gemini program are presented. The summary contains descriptions of selected studies in the fields of astronomy, navigation, radiation, geophysics, meteorology, photography, and communications. For individual titles, see N72-10857 through N72-10891.

SUBSIDIARY ANALYTIC CITATION


PRIMARY ANALYTIC ACCESSION AND LOCATION OF FULL CITATION AND ABSTRACT
PAGES IN PRIMARY REPORT
PRICE OF PRIMARY REPORT
N72-10862*# Geological Survey, Flagstaff, Ariz.
EXPERIMENT S029: EARTH-MOON LIBRATION REGIONS PHOTOGRAPHY
Elliott C. Morris In NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 71-75
(See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

VOLUME 10 NUMBER 19 / OCTOBER 8, 1972

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbo machinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N72-27992* + National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 18, MAY 1972
May 1972 113 p refs
(NASA-SP-7037(18)) Avail: NTIS HC $3.00 CSCL 01A

This special bibliography lists 367 reports, articles, and other documents introduced into the NASA scientific and technical information system in April 1972. Author

N72-27993* + National Aeronautics and Space Administration, Washington, D.C.
A CUMULATIVE INDEX TO THE 1971 ISSUES OF AERONAUTICAL ENGINEERING A Special Bibliography, Jan. 1972
Jan. 1972 779 p refs
(NASA-SP-7037(14)) Avail: NTIS HC $9.00 CSCL 01A

This publication is a cumulative index to the abstracts contained in NASA SP-7037 (02) through NASA SP-7037 (13) of Aeronautical Engineering: A Special Bibliography. Author

N72-27994*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORTRAN PROGRAM FOR CALCULATING TOTAL EFFICIENCY - SPECIFIC SPEED CHARACTERISTICS OF CENTRIFUGAL COMPRESSORS
Michael R. Galvas Washington Jul. 1972 45 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland, Ohio
(NASA-TM-X-2594; E-6884) Avail: NTIS HC $3.00 CSCL 12D

A computer program for predicting design point specific speed - efficiency characteristics of centrifugal compressors is presented with instructions for its use. The method permits rapid selection of compressor geometry that yields maximum total efficiency for a particular application. A numerical example is included to demonstrate the selection procedure. Author

N72-27995*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WIND TUNNEL INVESTIGATION OF AERODYNAMIC CHARACTERISTICS OF SCALE MODELS OF THREE RECTANGULAR SHAPED CARGO CONTAINERS
Georgene H. Laub and Hifu M. Kodani Jul. 1972 93 p Sponsored in part by AAMRDL
(NASA-TM-X-62169) Avail: NTIS HC $6.75 CSCL 01A

Wind tunnel tests were conducted on scale models of three rectangular shaped cargo containers to determine the aerodynamic characteristics of these typical externally-suspended helicopter cargo configurations. Tests were made over a large range of pitch and yaw attitudes at a nominal Reynolds number per unit length of 1.8 x one million. The aerodynamic data obtained from the tests are presented. Author

N72-27996# National Physical Lab., Teddington (England). Div. of Maritime Science.
MEASUREMENTS OVER A WIDE RANGE OF REYNOLDS NUMBERS OF THE WIND FORCES ON MODELS OF LATTICE FRAMEWORKS WITH TUBULAR MEMBERS
R. W. F. Gould and W. G. Raymer May 1972 32 p refs
(NPL-Mar-Sci-5-72) Avail: NTIS HC $3.75

Measurements were made in a compressed air tunnel to provide design data for wind loading on tubular lattice frameworks. Models tested included plane frames consisting of two vertical tubes and smaller diagonal bracing tubes having three selected solidity ratios, and towers of triangular and square planform constructed from these frames. The effect of joint gusset-plates and a maintenance ladder on one plane frame was examined. Graphs are included to show the effects of frame solidity and Reynolds number on the main loading components needed for tower design. The data extend to a Reynolds number 1.5 times 1 million based on the diameter of the vertical members. Author

N72-27997*# Dynatech Corp., Cambridge, Mass.
ANALYSIS AND TESTING OF HIGH ENTRAINMENT SINGLE NOZZLE JET PUMPS WITH VARIABLE MIXING TUBES
Kenneth E. Hickman, Philip G. Hill, and Gerald B. Gilbert Washington NASA Jun. 1972 141 p refs
(Contract NAS2-5845)
(NASA-CR-2067) Avail: NTIS HC $3.00 CSCL 01A

An analytical model was developed to predict the performance characteristics of axisymmetric single-nozzle jet pumps with variable area mixing tubes. The primary flow may be subsonic or supersonic. The computer program uses integral techniques to calculate the velocity profiles and the wall static pressures that result from the mixing of the supersonic primary jet and the subsonic secondary flow. An experimental program was conducted to measure mixing tube wall static pressure variations, velocity profiles, and temperature profiles in a variable area mixing tube with a supersonic primary jet. Static pressure variations were measured at four different secondary flow rates. These test results were used to evaluate the analytical model. The analytical results compared well to the experimental data. Therefore, the analysis is believed to be ready for use to relate jet pump performance characteristics to mixing tube design. Author

N72-27998*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

LOW SPEED AERODYNAMIC CHARACTERISTICS OF A LARGE SCALE MODEL WITH A THIN, HIGHLY SWEPT, 2.67 ASPECT RATIO WING HAVING A CRANKED LEADING EDGE

Demo J. Giulianetti and Ralph L. Maki Washington Aug. 1972 44 p refs

(NASA-TN-D-6919; A-3893) Avail: NTIS HC $3.00 CSCL 01A

The low speed aerodynamic characteristics of a large-scale model intended to represent advanced fixed-wing fighters have been investigated in the Ames 40 by 80 foot wind tunnel. The model possessed positive static longitudinal stability to nearly 28 deg angle of attack, the maximum tested, both with and without leading-edge flaps deflected. Lateral control with differentially deflected ailerons and a right wing spoiler simultaneously deployed as combined controls was only slightly greater than that with the differentially deflected ailerons deployed as a separate control without the spoiler. Measured lift and drag were in close agreement with that predicted by theory to about 14 deg angle of attack, including the prediction of lift due to 30 deg of trailing edge flap deflection. Estimated takeoff performance of an aircraft 4/3 the scale of the test model showed takeoff distances of less than 2000 ft. Author

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N72-27999*# Rochester Applied Science Associates, Inc., N.Y.

BLADE FREQUENCY PROGRAM FOR NONUNIFORM HELICOPTER ROTORS, WITH AUTOMATED FREQUENCY SEARCH Informal Final Report

S. Gene Sadler [1972] 135 p refs

(Contract NAS1-11216)

(NASA-CR-112071; RASA-72-01) Avail: NTIS HC $8.75 CSCL 01B

A computer program for determining the natural frequencies and normal modes of a lumped parameter model of a rotating, twisted beam, with nonuniform mass and elastic properties was developed. The program is used to solve the conditions existing in a helicopter rotor where the outboard end of the rotor has zero forces and moments. Three frequency search methods have been implemented. Including an automatic search technique, which allows the program to find up to the fifteen lowest natural frequencies without the necessity for input estimates of these frequencies. Author

N72-28000*# Techtran Corp., Glen Burnie, Md.

DYNAMIC TESTING OF HELICOPTER COMPONENTS

H. Schumacher Washington NASA May 1972 29 p Transl. into ENGLISH from Helicopter Fatigue Testing, Proc. of the DGLR Symp. on Helicopters and Propellers Stuttgart, DGLR, Dec. 1970 p 97-123 Conf. held in Immenstaad, West Ger., 24 Jun. 1969

(Contract NASw-2037)

(NASA-TT-F-14282) Avail: NTIS HC $3.50 CSCL 01B

The importance of dynamic component testing for the development of helicopters is presented. Using the development of the BO 105 as an example, the test planning and execution used demonstrate the multiplicity and range of the test purposes. Various tests are presented in a series of figures for clarification. Author

N72-28001*# Techtran Corp., Glen Burnie, Md.

STRUCTURAL STABILITY CONSIDERATIONS IN THE ROTOR SYSTEM OF THE HOT GAS JET HELICOPTER DO 132

L. Brenner Washington NASA Jun. 1972 23 p refs Transl. into ENGLISH from Helicopter Fatigue Testing, Proc. of the DGLR Symp. on Helicopters and Propellers Stuttgart, DGLR, Dec. 1970 p 77-96, 177 Conf. held in Immenstaad, West Ger., 24 Jun. 1969

(Contract NASw-2037)

(NASA-TT-F-14281) Avail: NTIS HC $3.25 CSCL 01B

The rotor system of a hot gas-jet helicopter is examined from the standpoint of resistance to vibration and stress on the structured system of the blades. The following subjects are discussed: (1) technical structural data of the helicopter, (2) construction of the rotor system, (3) principles of measurement for the structural stability of the rotor system, and (4) the operating test plan for the test blade. Engineering drawings of the helicopter systems and stress diagrams resulting from the tests are included. Author

N72-28002*# Hughes Tool Co., Culver City, Calif. Aircraft Div.

A PERFORMANCE APPLICATION STUDY OF A JET-FLAP HELICOPTER ROTOR

R. J. Sullivan, Sally LaForge, and Barry W. Holchin Washington NASA May 1972 96 p refs

(Contract NAS1-10365)

(NASA-CR-112030) Avail: NTIS HC $7.00 CSCL 01B

A performance study was made of the application of a jet-flap to a reaction-drive rotor for a heavy-lift helicopter mission and for a high-speed-helicopter maneuverability (200 knots, 2g) mission. The results of the study are as follows: As a result of the increase in maximum airfoil lift coefficient achieved by the jet-flap, rotor solidity is reduced with the jet-flap to approximately 59% of a nonjet-flap rotor. As a result of the saving in rotor solidity, and hence in rotor weight, the jet-flap configuration had a 21% higher productivity than a nonjet-flap configuration. Of the three propulsion systems studied utilizing a jet-flap (hot cycle, warm cycle, cold cycle) the hot cycle gave the largest increase in productivity. The 200 knot 2g mission is performed best with a warm cycle propulsion system. The jet-flap permits designing for a rotor blade loading coefficient C sub T/sigma = .170 at 2g without encountering blade stall. The jet-flap rotor permits a 200 knot 2g maneuver without suffering the penalty of an unreasonable rotor solidity that would be required by a nonjet-flap rotor.

Author

N72-28003*# Lockheed-Georgia Co., Marietta. Advanced Transport Technology.

STUDY OF THE APPLICATION OF ADVANCED TECHNOLOGIES TO LONG-RANGE TRANSPORT AIRCRAFT. VOLUME 2: RESEARCH AND DEVELOPMENT REQUIREMENTS Final Technical Report

R. H. Lange, R. F. Sturgeon, W. E. Adams, E. S. Bradley, J. F. Cahill, R. R. Eudaily, J. P. Hancock, and J. W. Moore [1972] 70 p refs

(Contract NAS1-10701)

(NASA-CR-112089) Avail: NTIS HC $5.50 CSCL 01B

Investigations were conducted to evaluate the relative benefits attainable through the exploitation of advanced technologies and to identify future research and development efforts required to permit the application of selected technologies to transport aircraft entering commercial operation in 1985. Results show that technology advances, particularly in the areas of composite materials, supercritical aerodynamics, and active control systems, will permit the development of long-range, high-payload commercial transports operating at high-subsonic speeds with direct operating costs lower than those of current aircraft. These advanced transports also achieve lower noise levels and lower engine pollutant emissions than current transports. Research and development efforts, including analytical investigations, laboratory test programs, and flight test programs, are required in essentially all technology areas to achieve the potential technology benefits. Author

N72-28004# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.

ON A PYROTECHNIC-BALLISTICAL DEPLOYMENT AID FOR PARACHUTES

R. Oliva 1972 40 p refs In GERMAN; ENGLISH summary (DLR-Mitt-72-07) Avail: NTIS HC $4.00; DFVLR Porz-Wahn: 12,50 DM

The construction and function of a pyrotechnic-ballistical device for parachute deployment are described. Instructions for installation are provided. It is stated that tests have shown a reduction in filling time of approximately 40 percent. Author

N72-28005# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.

AIRCRAFT NOISE STANDARDS AND REGULATIONS

Joseph K. Power Apr. 1971 73 p refs Presented at Tenn. Univ. Space Inst., 15-20 Mar. 1971 and at Tech. Univ. of Aachen, West Germany, 29 Mar. - 3 Apr. 1971 (FAA-RD-71-24) Avail: NTIS HC $5.75

Public laws and Federal Air Regulations concerning aircraft noise are examined. Noise exposure forecasts and various systems for rating aircraft noise world-wide are presented. Noise certification and aircraft retrofit regulations are discussed. Aircraft operational procedures to reduce noise are described. Author

N72-28006*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AIRCRAFT TIRE BEHAVIOR DURING HIGH-SPEED OPERATIONS IN SOIL

Tafford J. W. Leland and Eunice G. Smith Washington Aug. 1972 62 p refs (NASA-TN-D-6813; L-7641) Avail: NTIS HC $3.00 CSCL 01B

An investigation to determine aircraft tire behavior and operating problems in soil of different characteristics was conducted at the Langley landing-loads track with a 29 x 110.0-10, 8-ply-rating, type 3 tire. Four clay test beds of different moisture content and one sand test bed were used to explore the effects on axle drag loads developed during operation at different tire inflation pressures in free rolling, locked-wheel braking, and yawed (cornering) modes, all at forward speeds up to 95 knots. The test results indicated a complicated drag-load--velocity relationship, with a peak in the drag-load curve occurring near 40 knots for most test conditions. The magnitude of this peak was found to vary with tire inflation pressure and soil character and, in certain cases, might prove large enough to make take-off hazardous. Author

N72-28007*# Boeing Co., Seattle, Wash. Commercial Airplane Group.

DESIGN INTEGRATION AND NOISE STUDIES FOR JET STOL AIRCRAFT. VOLUME 1: PROGRAM SUMMARY Final Report

V. O. OKeefe and G. S. Kelley May 1972 56 p Original contains color illustrations (Contract NAS2-6344) (NASA-CR-114471; D6-40552-1-Vol-1) Avail: NTIS HC $5.00 CSCL 01B

This program was undertaken to develop, through analysis, design, experimental static testing, wind tunnel testing, and design integration studies, an augmentor wing jet flap configuration for a jet STOL transport aircraft having maximum propulsion and aerodynamic performance with minimum noise generation. The program had three basic elements: (1) static testing of a scale wing section to demonstrate augmentor performance and noise characteristics; (2) two-dimensional wind tunnel testing to determine flight speed effects on performance; and (3) system design and evaluation which integrated the augmentor information obtained into a complete system and ensured that the design was compatible with the requirements for a large STOL transport having a 500-ft sideline noise of 95 PNdB or less. This objective has been achieved. Author

N72-28008*# Scientific Translation Service, Santa Barbara, Calif.

IN A MODERN PLANE

V. S. Frolov Washington NASA Jul. 1972 43 p Transl. into ENGLISH of the book "V Sovremennom Samolete" Moscow, Znaniye Press, 1971 (Contract NASw-2035) (NASA-TT-F-14351) Avail: NTIS HC $4.25 CSCL 01C

The problems encountered by pilots of jet aircraft under various conditions of flight are discussed. The application of engineering psychology to solve difficulties encountered in jet aircraft flight is discussed. The devices available in the scientific organizations are described. Information is included on the biomechanics of the human organisms. The predicted configuration of cockpits of the future is analyzed. Author

N72-28009*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

WIND TUNNEL INVESTIGATION OF A LARGE SCALE 35 DEG SWEPT WING JET TRANSPORT MODEL WITH AN EXTERNAL BLOWING TRIPLE SLOTTED FLAP

Kiyoshi Aoyagi, Leo P. Hall, and Michael D. Falarski Washington Jul. 1972 75 p refs Sponsored in part by AARDL (NASA-TM-X-2600; A-3753) Avail: NTIS HC $3.00 CSCL 01B

An investigation was conducted to determine the aerodynamic characteristics of a large-scale subsonic jet transport model with an externally jet-augmented flap system that would augment lift and provide direct-lift control. The model had a 35 deg swept wing of aspect ratio 7.82 and two side-by-side engines mounted on a single pylon under each wing close to the fuselage. The lift of the flap system was augmented by jet engine exhaust impingement on the triple-slotted flap surfaces. The rearmost flap provided direct lift control. Results were obtained for several combinations of flap deflections at gross thrust coefficients from 0 to 2.0. Three-component longitudinal data are presented with four engines operating. Limited longitudinal and lateral data are presented for asymmetric and symmetric thrust conditions with three engines operating. For the same overall flap deflection, lift coefficient and maximum lift coefficient were improved 13 and 7 percent compared to coefficients obtained with a double-slotted flap configuration. A maximum lift coefficient of 6.3 was obtained at a gross thrust coefficient of 2.0. At the same flap deflection lateral and directional trim moment requirements with an engine inoperative were reduced 55 and 33 percent, respectively, compared to those with the engines located farther outboard on the wing. Trim moment requirements in pitch were also reduced significantly. However, pitching-moment instability occurred and increased with gross thrust coefficient. Author

N72-28010*# Hydrospace Research Corp., San Diego, Calif.

NOISE MEASUREMENTS OBTAINED DURING VISUAL APPROACH MONITOR EVALUATION IN 747 AIRCRAFT

Carole S. Tanner and Ray E. Glass May 1972 27 p refs (Contract NAS2-6490) (NASA-CR-114478; HRC-TR-S-213) Avail: NTIS HC $3.50 CSCL 01B

The results are reported of acoustic measurements made on the 747 aircraft during visual approach monitor evaluation approaches. This display is designed to improve approach and landing precision under visual flight rule conditions. The purpose of the acoustic portion of the test was to measure, evaluate, and identify the noise levels during various types of aircraft approaches. Six noise measurement sites were positioned on the centerline of the approach ground track. The six noise measurement stations on the approach ground track were positioned between approximately 1 and 6 nautical miles from runway threshold. The 1-nautical mile point was chosen as the beginning of the ground track because it is specified as the approach measurement point in the FAA noise certification requirements. The 6-nautical mile point was chosen for its proximity to the point where the approach is initiated. Author

N72-28011*# Techtran Corp., Glen Burnie, Md.
FLIGHT PECULIARITIES OF AIRCRAFT IN THE ATMOSPHERES OF PLANETS
G. M. Moskalenko Washington NASA Aug. 1972 16 p refs Transl. into ENGLISH of "O Nekotorykh Osobennostyakh Poleta Letatelnykh App. v Atmosfere Planet" Rept. PR-84 Inst. for Space Res., Acad. Sci. USSR, Moscow, 1971 22 p
(Contract NASw-2037)
(NASA-TT-F-14344; PR-84) Avail: NTIS HC $3.00 CSCL 01B

Certain questions of flight dynamics of aircraft in the atmospheres of planets are considered. The equations of dynamics of an aerostatic aircraft and their solutions for cases of motion with and without lift and drag are included. It is shown that in certain cases there is a trajectory-parametric analogy between aerostatic and aerospace vehicles. Author

N72-28012*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AERODYNAMIC CHARACTERISTICS OF A LARGE-SCALE LIFT-ENGINE FIGHTER MODEL WITH EXTERNAL SWIVELING LIFT-ENGINES
Jerry P. Barrack and Jerry V. Kirk Jul. 1972 101 p refs
(NASA-TM-X-62167) Avail: NTIS HC $7.25 CSCL 01B

The aerodynamic characteristics of a six-engine (four lift, two lift-cruise) lift-engine model obtained in the Ames 40- by 80-foot wind tunnel are presented. The model was an approximate one-half scale representation of a lift-engine VTOL fighter aircraft with a variable-sweep wing. The four lift-engines were housed in the aft fuselage with the inlets located above the wing. Longitudinal and lateral-directional force and moment data are presented for a range of exhaust gas momentum ratios (thrust coefficients). Wind tunnel forward speed was varied from 0 to 140 knots corresponding to a maximum Reynolds number of 6.7 million. The data are presented without analysis. Author

N72-28013# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
ENVIRONMENTAL STUDIES: AVIATION NOISE EVALUATIONS AND PROJECTIONS, SAN FRANCISCO BAY REGION
Aug. 1971 139 p refs Sponsored by HUD
Avail: NTIS HC $9.00

An analysis of noise problems created by aircraft operations at airport in the San Francisco, California area is presented. The objectives of the analysis are to: (1) recommend analytic procedures for evaluating the impact of noise from aircraft sources in the region, (2) apply analytic procedures to describe the aircraft noise at commercial airfields and military air bases, (3) study the noise environment generated by operations in transition air spaces, and (4) provide technical information and consultation in establishing noise impact criteria and in evaluating the effect of the noise from aircraft operations on the liveability of the region. Author

N72-28014# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Behavioural Sciences Div.
THE EFFECTIVENESS OF TWO TYPES OF INSULATION IN THE CHSS-2 HELICOPTER
S. E. Forshaw and R. A. Stong Mar. 1972 15 p refs
(DCIEM-839) Avail: NTIS HC $3.00

Narrow-band, octave-band, and overall sound pressure levels were measured in two CHSS-2 helicopters, one with an older thin acoustic treatment and one with a new thick treatment. The noise levels at the sonar operator's position are not reduced significantly when an acoustic bulkhead and door treated with the thin sound absorbed are installed across station 155. The noise levels at this location are reduced by 8 to 15 db in the octave bands between 500 and 4000 Hz, however, when the bulkhead and door are treated with the thick absorber. Provided crew members wear properly fitted flight helmets, the noise in the CHSS-2 helicopter does not constitute a potential long-term hazard to the hearing of the crew. However, its pure tone components undoubtedly reduce the detection efficiency of sonar operations. Author

N72-28015*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF STABILIZATION ON VTOL AIRCRAFT IN HOVERING FLIGHT
Richard K. Greif, Emmett B. Fry, Ronald M. Gerdes, and Terrence D. Gossett Washington Aug. 1972 24 p refs Prepared in cooperation with Army Air Mobility Res. and Develop. Lab., Moffett Field, Calif.
(NASA-TN-D-6900; A-4015) Avail: NTIS HC $3.00 CSCL 01B

A motion simulator study was conducted to determine the effects of roll and pitch stabilization on the handling qualities and control power requirements of VTOL aircraft during hover and short-distance maneuvering flight. Three levels of stabilization complexity were compared: (1) no stabilization, (2) rate stabilization, and (3) attitude stabilization. Control sensitivities and stabilization gains were optimized prior to comparison. Results are presented to show how the optimum systems were determined and how they compared with each other at different levels of control power. Comparisons were made both in calm air and in the presence of roll disturbances. Results indicate the attitude-stabilized system provides the best handling qualities for the least amount of control power. Author

N72-28016# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORTS, BRIEF FORMAT, US CIVIL AVIATION, ISSUE NO. 4, 1970 ACCIDENTS
21 Dec. 1971 512 p
(NTSB-BA-72-1) Avail: NTIS HC $27.75

Selected aircraft accident reports, in brief format, occurring in U.S. civil aviation operations during calendar year 1970 are presented. The 900 general aviation accidents contained in this publication represent a random selection. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, kind of flying, injury index, aircraft damage, conditions of light, pilot certificate, injuries, and causal factors. Author

N72-28017*# Boeing Co., Renton, Wash. Commercial Airplane Div.
PREDICTED FLIGHT CHARACTERISTICS OF THE AUGMENTOR WING JET STOL RESEARCH AIRCRAFT
R. E. Spitzer Jul. 1972 180 p refs
(Contract NAS2-6025)
(NASA-CR-114463; D6-40381) Avail: NTIS HC $11.00 CSCL 01B

An existing deHavilland C-8A airplane has been modified into an augmentor wing flight test vehicle. Research objectives are to verify the augmentor flap concept and to produce data for STOL airworthiness criteria. The Modified C-8A provides the means for jet-STOL flight research down to a 60 knot approach speed. The airplane has a high thrust-to-weight ratio, high-lift flap system, vectored thrust, powerful flight controls, and lateral-directional stability augmentation system. Normal performance and handling qualities are expected to be satisfactory. Analysis and piloted simulator results indicate that stability and control characteristics in conventional flight are rated satisfactory. Handling qualities in the STOL regime are also generally satisfactory, although pilot workload is high about the longitudinal axis. Author

N72-28018*# Washington Univ., St. Louis, Mo. Dept. of Mechanical and Aerospace Engineering.
CONCEPTS FOR A THEORETICAL AND EXPERIMENTAL STUDY OF LIFTING ROTOR RANDOM LOADS AND VIBRATIONS. PHASE 6-A: EFFECTS OF BLADE TORSION, OF BLADE FLAP BENDING FLEXIBILITY AND OF ROTOR SUPPORT FLEXIBILITY ON ROTOR STABILITY AND RANDOM RESPONSE
Kurt H. Hohenemser and S. K. Yin Jun. 1972 134 p refs
(Contract NAS2-4151)

(NASA-CR-114480) Avail: NTIS HC $8.75 CSCL 01B

The effects of lifting rotor blade torsion, blade flap bending flexibility and rotor support flexibility on rotor stability and random response are described. The subjects discussed are: (1) blade representation and method of analysis, (2) random gust response statistics for coupled torsion-flapping rotor blade vibrations, (3) flap bending corrections to the rigid blade analysis of lifting rotors, and (4) effects of rotor support flexibility. The response of linear periodically time varying systems to random excitation is examined. Author

N72-28019*# Washington Univ., St. Louis, Mo. Dept. of Mechanical and Aerospace Engineering.
CONCEPTS FOR A THEORETICAL AND EXPERIMENTAL STUDY OF LIFTING ROTOR RANDOM LOADS AND VIBRATIONS. PHASE 6-B: EXPERIMENTS WITH PROGRESSING/REGRESSING FORCED ROTOR FLAPPING MODES
Kurt H. Hohenemser and S. T. Crews Jun. 1972 72 p refs
(Contract NAS2-4151)
(NASA-CR-114481) Avail: NTIS HC $5.75 CSCL 01B

A two bladed 16-inch hingeless rotor model was built and tested outside and inside a 24 by 24 inch wind tunnel test section at collective pitch settings up to 5 deg and rotor advance ratios up to .4. The rotor model has a simple eccentric mechanism to provide progressing or regressing cyclic pitch excitation. The flapping responses were compared to analytically determined responses which included flap-bending elasticity but excluded rotor wake effects. Substantial systematic deviations of the measured responses from the computed responses were found, which were interpreted as the effects of interaction of the blades with a rotating asymmetrical wake. Author

N72-28020*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMULATION STUDY OF THE LIFT ROLL COUPLING PROBLEM FOR HOVERING VTOL AIRCRAFT
Robert A. Jacobsen and Richard K. Greif Washington Aug. 1972 18 p refs
(NASA-TN-D-6906; A-3172) Avail: NTIS HC $3.00 CSCL 01B

The effects of lift-roll coupling on the handling qualities of hovering VTOL aircraft using differential thrust for roll control were assessed in a piloted simulation study in the Ames six-degrees-of-freedom motion simulator. The configuration tested has three vertical thrust sources, one on the roll axis and two laterally displaced from the roll axis, with a thrust distribution of 25%/50%/25%. The outboard thrust sources were modulated to provide roll control whereas all three provided height control. Maximum thrust-to-weight ratio was varied together with a coupling parameter that combined roll-inertia, weight, and engine location. Results showed that handling qualities are affected not only by the occurrence of lift-roll coupling (dependent on both variables) but also by the severity of the coupling (dependent on the coupling parameter alone). However, the advantages of differential thrust for control can be retained with careful design. Author

N72-28021# Texas A&M Univ., College Station. Dept. of Industrial Engineering.
RELIABILITY/MAINTAINABILITY TRADE-OFF PROCEDURE FOR THE MAIN ROTOR BLADE OF A HEAVY LIFT HELICOPTER M.S. Thesis
Royace H. Prather 1971 42 p refs Sponsored in part by Army
(AD-739582) Avail: NTIS CSCL 01/3

The paper develops a quantitative procedure for trading off reliability and maintainability parameters on the main rotor blade of a heavy lift helicopter. The procedure through the use of the probability tree makes possible the calculation of estimated operational availability and life cycle cost of the main rotor blade at the organizational level (Aviation Company) within the Department of Army. The predicted life cycle costs of the blade presented in the procedure is given on a cost per organizational unit per month basis in order that the blade cost can be used as an input to the fleet life cycle cost of the heavy lift helicopter. Author (GRA)

N72-28022# Boeing Co., Philadelphia, Pa. Vertol Div.
CH-47A B AND C SERIES HELICOPTER ROTOR BLADE FAILURE AND SCRAP RATE DATA ANALYSIS Final Report
R. L. Hunt Fort Eustis, Va. Army Air Mobility Res. and Develop. Lab. Nov. 1971 120 p refs
(Contract DAAJ02-71-C-0014; DA Proj. 1F1-62205-A-1119)
(AD-739568; D210-10340-1; USAAMRDL-TR-71-58) Avail: NTIS CSCL 01/3

The report provides the results of an analysis of failure data derived from depot inspection, overhaul/rework, and scrappage reports on 5,488 rotor blades of the CH-47 series tandem rotor helicopters. Two types of rotor blades were analyzed for blade mean-time-between-removals, mean-time-to-removals, mean-time-between-unscheduled-removals and mean-time-between-scrappage. Locations on these blades for the major discrepancies were determined. Blade teardown experience was determined. A cost comparison of blade acquisition costs versus the average cost of repair/rework was provided. Author (GRA)

N72-28023# Dynamic Science, Phoenix, Ariz.
EVALUATION OF THE UH-1D/H HELICOPTER CRASH-WORTHY FUEL SYSTEM IN A CRASH ENVIRONMENT Final Report
Richard L. Cook and Donald E. Goebel Nov. 1971 182 p
(Contract DAAJ02-69-C-0030; DA Proj. 1F1-62203-A-529)
(AD-739567; Rept-1520-71-15; USAAMRDL-TR-71-47) Avail: NTIS CSCL 01/2

The primary objective of the program was to obtain empirical data to evaluate the effectiveness of the UH-1D/H helicopter crash-resistant fuel system when subjected to a severe but survivable crash environment. These data would reveal any specific weaknesses which still remain in the system that would cause a serious fire hazard. Since the performance of the various system components is the key to the effectiveness of the system, the evaluation of these components was the secondary objective of the program. GRA

N72-28024# Rensselaer Polytechnic Inst., Troy, N.Y. Systems Engineering Div.
ADAPTIVE PARAMETER IDENTIFICATION
Howard Kaufman and Daniel Beaulier 1971 22 p refs
(Contract DAAB07-69-C-0365)
(AD-739694) Avail: NTIS CSCL 12/1

An extended Kalman filter with a fictitious noise input is developed for tracking time varying parameters. An adaptation algorithm is used for adjusting the covariance of the fictitious noise according to the magnitude of the measured residuals. Application of the filter to the tracking of time varying VTOL parameters is shown to give an off line model that reproduces the process behavior much better than a model with fixed parameters. Author (GRA)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators, and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems.

N72-28025* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
METHOD FOR CONTROLLING VAPOR CONTENT OF A GAS Patent

Billy G. Moser and Robert F. Landel, inventors (to NASA) Issued 11 Jul. 1972 4 p Filed 16 Dec. 1969 Supersedes N70-35641 (08 - 19, p 3474) Sponsored by NASA
(NASA-Case-NPO-10633; US-Patent-3,675,712; US-Patent-Appl-SN-885521; US-Patent-Class-165-3; US-Patent-Class-165-20; US-Patent-Class-62-93) Avail: US Patent Office CSCL 13G

A method and a system are described for controlling the vapor content of a gas delivered to an environmental test chamber. The method is characterized by utilization of a pressurized source of gas coupled with a hermetically sealed system including a saturation tank containing a vaporific fluid. The system has an inundated gas intake port and an elevated gas discharge port, coupled with a group of series-connnected condenser units seated in a chilled bath and maintained at a selected temperature. The gas becomes saturated with a vapor of the liquid contained within the saturation tank and is then selectively dried at the condenser as selected quantities of the vapor are removed by condensation as the gas is delivered through it. P.N.F.

N72-28026# British Aircraft Corp., Filton (England).
A STUDY OF ADVANCED SOLAR ARRAY DESIGN Quarterly Report, 1 Feb. - 30 Apr. 1969
D. W. Mann, comp. and K. K. Reinhartz, comp Jun. 1969 80 p refs
(Contract ESTEC-623/68sl)
(ESRO-CR-7; QR-1) Avail: NTIS HC $6.00

The design and development of a high power-to-weight ratio, low storage volume, solar array are discussed. The array is constructed from a flexible substrate to which silicon solar cells are attached. The substrate and solar cell assembly is stowed on a 20 centimeter diameter drum located within the spacecraft. The selection and testing of material combinations for flexible substrate structure, adhesives, solar cells, interconnection and cushioning. Author

N72-28027*# North Carolina State Univ., Raleigh.
A FAST ACTING ELECTRICAL SERVO FOR THE ACTUATION OF FULL SPAN, FOWLER-TYPE WING FLAPS IN DLC APPLICATIONS: A DETAIL DESIGN STUDY
Frederick O. Smetana, Rafael J. Montoya, and Ronald K. Carden Washington NASA Jul. 1972 88 p
(Grant NGR-34-002-086)
(NASA-CR-2059) Avail: NTIS HC $3.00 CSCL 09E

The philosophy and detail design of an electro-mechanical actuator for Fowler-type wing flaps which have a response time constant of 0.025 seconds are described. A conventional electrical servomotor with a power rating twice the maximum power delivered to the load is employed along with adaptive, gain-scheduled feedback and various logic circuits, including one to remove electrical excitation from the motor during extended periods when no motion of the flap is desired. Author

N72-28028*# AiResearch Mfg. Co., Los Angeles, Calif.
STUDY OF AIRCRAFT ELECTRICAL POWER SYSTEMS Final Technical Report
Jun. 1972 487 p refs
(Contract NAS3-14367)
(NASA-CR-120939; AiR-72-8414) Avail: NTIS HC $24.35 CSCL 09E

The formulation of a philosophy for devising a reliable, efficient, lightweight, and cost effective electrical power system for advanced, large transport aircraft in the 1980 to 1985 time period is discussed. The determination and recommendataion for improvements in subsystems and components are also considered. All aspects of the aircraft electrical power system including generation, conversion, distribution, and utilization equipment were considered. Significant research and technology problem areas associated with the development of future power systems are identified. The design categories involved are: (1) safety-reliability, (2) power type, voltage, frequency, quality, and efficiency, (3) power control, and (4) selection of utilization equipment. Author

N72-28029# Yardney Electric Corp., Pawcatuck, Conn.
WATER ACTIVATED ZINC-AIR STANDARD LINE BATTERY BA-535 ( )/U Final Report, Jan. 1969 - Nov. 1971
James Skelton Feb. 1972 29 p
(Contract DAAB07-69-C-0146; DA Proj. 1T6-62705-A-053)
(AD-739997; ECOM-0146-F) Avail: NTIS CSCL 10/3

The report describes the work performed to design and fabricate twenty five (25) BA-535 Exploratory Development batteries in accordance with the technical guidelines for a six pound water activated Zinc/Air battery. The batteries were tested at 0 F, 20 F, room temperature, and 125 F. In addition, batteries were discharged following 7-day activated stand at room temperature and 100 hour activated stand at 125 F. The report discusses design, fabrication, results and conclusions. Author (GRA)

N72-28944* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
JPL LITHIUM DOPED SOLAR CELL DEVELOPMENT PROGRAM
P. A. Berman *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 29-36 (For availability see N72-28941 19-34)
CSCL 10A

N72-28945* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
METHODS FOR UTILIZING MAXIMUM POWER FROM A SOLAR ARRAY
D. K. Decker *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 37-48 refs (For availability see N72-28941 19-34)
CSCL 10A

N72-28948* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
LIFETIME ESTIMATES FOR STERILIZABLE SILVER-ZINC BATTERY SEPARATORS
E. F. Cuddihy, D. E. Walmsley, and J. Moacanin *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 72-81 refs (For availability see N72-28941 19-34)
CSCL 10C

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N72-28030 National Lending Library for Science and Technology, Boston Spa (England).
RECOGNITION AND DIRECTION FINDING PROCESSES IN VESPERTILIONID BATS
G. N. Simkin Apr. 1972 20 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Biol. Pochvoved. (Moscow), no. 2, 1971 p 17-24
(NLL-RTS-6933) Avail: Natl. Lending Library, Boston Spa, Engl.: £1.80; 6 NLL photocopy coupons

The developmental aspects and evolution of echo location in Vespertilionid bats are discussed. Experimental results involving evolutionary adaptive modifications, recognition and location of flat targets, and recognition and location of volumetric targets are given. E.H.W.

N72-28031 National Lending Library for Science and Technology, Boston Spa (England).
THE SECRETION OF PEPSINOGEN AND AMYLASE IN PERSPIRATION
Kh. Kh. Abdurakhmanov 28 Feb. 1972 6 p Transl. into

ENGLISH of a Russian rept. from the Faculty of Std. Physiol. and Nervous Diseases at the Andizhanskiy Med. Inst.
(NLL-DRIC-Trans-2580-(3623.66)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

An attempt was made to use the amount of digestive enzymes present in perspiration as a diagnostic tool. Tests were made to determine the relationship of fermet secretions in sweat and the change in blood plasma content and the relationship of renal secretions to other factors affecting the secretion of digestive enzymes. Pepsinogen and amylase, and healthy people and people with various stomach disorders were used in the study. Results are given in tables. No clear cut diagnostic use of enzyme presence in perspiration was established. E.H.W.

N72-28032*+ National Aeronautics and Space Administration, Washington, D.C.
A CUMULATIVE INDEX TO A CONTINUING BIBLIOGRAPHY ON AEROSPACE MEDICINE AND BIOLOGY, JANUARY 1972
Jan. 1972 699 p refs
(NASA-SP-7011(98)) Avail: NTIS HC $37.00 CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N72-28033*# Illinois Univ., Urbana. Engineering Experiment Station.
ANALYTICAL PREDICTION OF THE HEAT TRANSFER FROM A BLOOD VESSEL NEAR THE SKIN SURFACE WHEN COOLED BY A SYMMETRICAL COOLING STRIP
J. C. Chato and A. Shitzer Dec. 1971 25 p refs
(Grant NGR-14-005-103)
(NASA-CR-127460; ME-TR-344) Avail: NTIS HC $3.25 CSCL 06P

An analytical method was developed to estimate the amount of heat extracted from an artery running close to the skin surface which is cooled in a symmetrical fashion by a cooling strip. The results indicate that the optimum width of a cooling strip is approximately three times the depth to the centerline of the artery. The heat extracted from an artery with such a strip is about 0.9 w/m-C which is too small to affect significantly the temperature of the blood flow through a main blood vessel, such as the carotid artery. The method is applicable to veins as well. Author

N72-28034*# Midwest Research Inst., Kansas City, Mo.
CLEAN ROOM TECHNOLOGY IN SURGERY SUITES
22 May 1971 218 p refs Conf. held at John F. Kennedy Space Center, Fla., 21-22 May 1971
(Contract NASw-1936; MRI Proj. 3332-E(D))
(NASA-CR-127442) Avail: NTIS HC $13.00 CSCL 06E

The principles of clean room technology and the criteria for their application to surgery are discussed. The basic types of surgical clean rooms are presented along with their advantages and disadvantages. Topics discussed include: microbiology of surgery suites; principles of laminar airflow systems, and their use in surgery; and asepsis and the operating room. F.O.S.

N72-28035*# Martin Marietta Corp., Denver, Colo.
EXPERIMENTAL SYSTEM FOR THE CONTROL OF SURGICALLY INDUCED INFECTIONS Operating and Maintenance Instructions
May 1972 33 p Revised
(Contract NASw-2210)
(NASA-CR-127641; MCR-71-326-Issue-2-Rev) Avail: NTIS HC $3.75 CSCL 06E

The experimental system is described, and the procedures for surgery usage and maintenance are outlined. Basically the system consists of the following: (1) a portable clean room comprised of a horizontal laminar flow filter system and a transparent walled enclosure, (2) a helmet-shoulder pad assembly, (3) a communications system, (4) a helmet ventilation system, and (5) surgical gowns. D.L.G.

N72-28036*# Martin Marietta Corp., Denver, Colo.
EXPERIMENTAL SYSTEM, AND ITS EVALUATION FOR THE CONTROL OF SURGICALLY INDUCTED INFECTIONS Final Report
Marvin D. Tevebaugh and J. Phillip Nelson May 1972 93 p refs
(Contract NASw-2210)
(NASA-CR-127449; MCR-72-80) Avail: NTIS HC $6.75 CSCL 06E

The effect is reported to design, fabricate, test and evaluate a prototype experimental system for the control of surgically induced infections. The purpose is to provide the cleanest possible environment within a hospital surgery room and eliminate contamination sources that could cause infections during surgery. The system design is described. The system provides for a portable laminar flow clean room, a full bubble helmet system with associated communications and ventilation subsystems for operating room personnel, and surgical gowns that minimize the migration of bacteria. The development test results consisting of portability, laminar flowrate, air flow pattern, electrostatic buildup, noise level, ventilation, human factors, electrical and material compatibility tests are summarized. The conclusions are that the experimental system is effective in reducing the airborne and wound contamination although the helmets and gowns may not be a significant part of this reduction. Definitive conclusions with regard to the infection rate cannot be made at this time. Author

N72-28037*# Michigan Univ., Ann Arbor. School of Natural Resources.
REMOTE SENSING OF CHANGES IN MORPHOLOGY AND PHYSIOLOGY OF TREES UNDER STRESS Annual Progress Report
Charles E. Olson, Wayne G. Rohde, and Jennifer M. Ward Berkeley, Calif. Calif. Univ. Forestry Remote Sensing Lab. 30 Sep. 1971 84 p refs Prepared for Calif. Univ., Berkeley. Forestry Remote Sensing Lab. in cooperation with Dept. of Agr. Forest Serv.
(NASA Order W-13308)
(NASA-CR-127640; APR-5) Avail: NTIS HC $6.25 CSCL 02D

Measurements on foliage samples collected from several drought and salt treated plants revealed that leaf thickness decreased with increasing severity of the drought treatment and increased with increasing severity of treatment with NaCl, but remained essentially unaffected by treatment with CaCl2. Airborne data collected by multispectral scanner indicated that false color images provide selective enhancement of a diseased area. Comparison of simulated and actual aerial color and color IR photography revealed that the color renditions of the MSS simulations agreed closely with those of the actual photography. Author

N72-28038# Joint Publications Research Service, Arlington, Va.
REPORTS FROM PSYCHOLOGICAL CONGRESSES, USSR
26 Jun. 1972 80 p refs Transl. into ENGLISH from Vorp. Psikhologii (Moscow), no. 5, Sep.-Oct. 1971 p 150-161 and 165-189
(JPRS-56351) Avail: NTIS HC $6.00

Articles on engineering psychology research on man-machine systems, problems of personality psychology, and a USSR psychologists' society conference are presented. Author

N72-28039*# Electronic Associates, Inc., Long Branch, N.J.
THE STUDY OF HUMAN VENOUS SYSTEM DYNAMICS USING HYBRID COMPUTER MODELING

M. F. Snyder and V. C. Rideout (Wis. Univ.) Washington NASA Jul. 1972 33 p refs Prepared jointly with Medical Physics Inst., Utrecht, Holland
(Grant NGR-50-002-083)
(NASA-CR-2084) Avail: NTIS HC $3.00 CSCL 06P

A computer-based model of the cardiovascular system was created emphasizing effects on the systemic venous system. Certain physiological aspects were emphasized: effects of heart rate, tilting, changes in respiration, and leg muscular contractions. The results from the model showed close correlation with findings previously reported in the literature. Author

N72-28040*# Battelle-Northwest, Richland, Wash.
THE MEASUREMENT OF RADIATION EXPOSURE OF ASTRONAUTS BY RADIOCHEMICAL TECHNIQUES Quarterly Research Report, 5 Jul. - 3 Oct. 1971
R. L. Brodzinski 15 Oct. 1971 19 p refs Sponsored by NASA
(Contract AT(45-1)-1830)
(NASA-CR-127563; BNWL-1183-10) Avail: NTIS HC $3.00 CSCL 06R

The urine specimens collected pre- and postflight from the Apollo 15 mission were analyzed for their radionuclide content. Cosmic radiation dose estimates of 695 and 660 mR are calculated from the observed Na-22 and Na-24 concentrations respectively. The concentrations of Na-22, Na-24, K-40, K-42, Cr-51, Fe-59, and Cs-137 are given. The potassium excretion patterns of high postflight and low preflight levels established for previous missions appears to be reversed for this mission. The concentrations of 23 major, minor, and trace elements in the fecal samples from the Apollo 14 astronauts are reported. Most elemental excretion rates are comparable to rates reported for earlier missions. The major exception is potassium where loss rates are the lowest ever observed. This coincides with the anomalously low excretion of potassium in postflight urine specimens. Apparent mass balance of calcium and iron continues as in the Apollo 12 and 13 missions. Author

N72-28041*# Office of Naval Research, Washington, D.C. Ocean Science and Technology Div.
PROJECT TEKTITE 1: A MULTIAGENCY 60-DAY SATURATED DIVE
D. C. Pauli, ed. and Cole H. A., ed. 16 Jan. 1970 413 p refs Sponsored in part by NASA, Dept. of Interior, and Gen. Elec.
(NASA-CR-127689; ONR-DR-153) Avail: NTIS; SOD $3.00 CSCL 06S

The history, organization, and accomplishments of Project Tektite are presented. The project demonstrated that it is possible for men to live and work successfully at underwater depths of 49 feet. The biomedical responses of the aquanauts to the 60 day dive are described. The behavioral and psychological responses to each other, the work, and the isolated environment are reported. The experiments conducted in the fields of marine science, psychological sciences, and biomedical sciences are discussed. Author

N72-28042*# National Aeronautics and Space Administration, Washington, D.C.
TESTS OF CHEMICAL COLD STERILIZATION OF SOME NUTRIENT MEDIA
K. Luehrs Jul. 1972 4 p Transl. into ENGLISH from Mykosen (Berlin), v. 14, no. 4, 1971 p 195-196
(NASA-TT-F-14412) Avail: NTIS HC $3.00 CSCL 06M

An attempt was made to cold-sterilize some nutrient media with pyro-carbonic diethylester in the sense that the medium was to be freed of all germs capable of propagation. Satisfactory results were obtained. Author

N72-28043*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MATHEMATICAL MODELS OF THERMOREGULATION AND HEAT TRANSFER IN MAMMALS. A COMPENDIUM OF RESEARCH
Avraham Shitzer Jul. 1972 75 p refs
(NASA-TM-X-62172) Avail: NTIS HC $5.75 CSCL 06C

An annotated compendium on mathematical modeling of mammal thermoregulation systems is presented. Author abstracts, tables containing the more used mathematical models, solutions to these models, and each thermoregulation mechanism considered are included. E.H.W.

N72-28044# Joint Publications Research Service, Arlington, Va.
CURRENT PROBLEMS IN SPACE BIOLOGY AND MEDICINE
14 Jul. 1972 162 p Transl. into ENGLISH of the book "Aktualnyye Voprosy Kosmicheskoy Biologii i Meditsiny" Moscow, 1971
(JPRS-56499) Avail: NTIS HC $10.25

This collection of articles is devoted to current research conducted in space biology and medicine using cosmonauts on the Soyuz spaceship and animal subjects as well as plant life. Author

N72-28045*# Texas Univ., Houston. School of Public Health.
[CULEX QUINQUEFASCIATUS BREEDING SITES] Quarterly Report, 3 Apr. - 4 Jul. 1972
4 Jul. 1972 25 p
(Contract NAS9-12696)
(NASA-CR-115708; QR-1) Avail: NTIS HC $3.25 CSCL 06C

The development of techniques, equipment, and methods for implementing ground truth data on Culex quinquefasciatus breeding sites are outlined. E.H.W.

N72-28046*# Scientific Translation Service, Santa Barbara, Calif.
STRUCTURE OF THE YEAST CELL ENVELOPE
Tadashi Hirano Washington NASA Jun. 1972 20 p refs Transl. into ENGLISH from Saibo (Japan), v. 3, no. 9, 1971 p 15-21
(Contract NASw-2035)
(NASA-TT-F-14308) Avail: NTIS HC $3.00 CSCL 06M

The structures of cell walls and plasma membranes are studied, by the freeze-etching method. A diagram of the cell envelope proposed is presented. Author

N72-28047*# Connecticut Univ., Storrs. Dept. of Pathobiology.
STUDIES OF EFFECTS OF CLOSED MICROBIAL ECOLOGY. REPORT OF 180-DAY TEST PERIOD
Alan J. Kenyon 15 May 1972 114 p refs
(Contract NAS9-10844)
(NASA-CR-115678) Avail: NTIS HC $7.75 CSCL 06M

Experiments were performed to determine the influence closed microbial ecologies have on modification or simplification of natural intestinal flora of ferrets in a closed environmental system. On the basis of previous tests in which certain species (Salmonella and Bacteroides) were decreased at 90 days of enclosure, a second trial was constructed for 180-day tests. In this trial there was little difference in the 8 major classes of intestinal flora between animals in the Open and Closed environmental groups except for the level of Lactobacillus. It is of extreme importance to note that when both Open and Closed groups contracted hemorrhagic gastritis, the interrelationship of this agent with other intestinal flora produced a more profound effect on animals from the Closed Group, particularly with reference to Lactobacillus levels. Author

N72-28048*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MICROBIAL BURDEN PREDICTION MODEL FOR UNMANNED PLANETARY SPACECRAFT Final Report
A. R. Hoffman and D. A. Winterburn 30 Jun. 1972 83 p refs
(Contract NAS7-100)
(NASA-CR-127467; JPL-900-566) Avail: NTIS HC $6.25

CSCL 06M

The technical development of a computer program for predicting microbial burden on unmanned planetary spacecraft is outlined. The discussion includes the derivation of the basic analytical equations, the selection of a method for handling several random variables, the macrologic of the computer programs and the validation and verification of the model. The prediction model was developed to (1) supplement the biological assays of a spacecraft by simulating the microbial accretion during periods when assays are not taken; (2) minimize the necessity for a large number of microbiological assays; and (3) predict the microbial loading on a lander immediately prior to sterilization and other non-lander equipment prior to launch. It is shown that these purposes not only were achieved but also that the prediction results compare favorably to the estimates derived from the direct assays. The computer program can be applied not only as a prediction instrument but also as a management and control tool. The basic logic of the model is shown to have possible applicability to other sequential flow processes, such as food processing. Author

N72-28049*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

LABORATORY VERIFICATION OPTICAL SIGNAL COUPLING. IMBLMS PHASE B.4, APPENDIX C, SECTION 12

21 Dec. 1970 18 p

(Contract NAS9-10742)

(NASA-CR-115719; LMSC-A980463-App-C-Sec-12) Avail: NTIS HC $3.00 CSCL 20A

The design of optical couplers is described for use in the IMBLMS hardwire mode. One coupler transmits data from the bio-belt to the central data system and the other coupler transmits audio frequencies in the opposite direction, from the central data system to the bio-belt. The objective is to isolate the ground system at the body worn bio-belt electronics and the main ground at the central data system, or biomedical and behavioral station. The safety of the subject wearing the bio-belt measuring electronics is the purpose in isolating the wearer from the main system ground. Author

N72-28050*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

LABORATORY VERIFICATION RESPIRATORY MEASUREMENTS. IMBLMS PHASE B.4, APPENDIX C, SECTION 13 Final Report

11 Dec. 1970 23 p

(Contract NAS9-10742)

(NASA-CR-115718; LMSC-A980463-App-C-Sec-13) Avail: NTIS HC $3.25 CSCL 06P

The B-4 IMBLMS preliminary design of the respiratory measurement element includes certain techniques and apparatus which are quite different from those included in the B-3 version previously delivered to NASA-MSC. A working model was constructed in the laboratory to prove the feasibility of certain key features. The most critical of these is the capability of switching sample gases into the mass spectrometer from two different sources during a single breath cycle. Results proved the feasibility of all of the concepts which were tested, and certain refinements and improvements were included, as well. Author

N72-28051*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

CONTINUOUS ANIMAL EXPOSURE TO DICHLOROMETHANE

J. D. MacEwen, E. H. Vernot, and C. C. Haun May 1972 31 p refs

(NASA Order T-80498; Contract F33615-70-C-1046)

(NASA-CR-127698; AMRL-TR-72-28; W-71005) Avail: NTIS HC $3.75 CSCL 06C

Continuous exposures of dogs, monkeys, rats and mice to 5000 ppm and 1000 ppm of dichloromethane vapor (CH_2Cl_2) produced severe toxic effects on dogs, rats and mice. Dogs died after 3 weeks exposure to 1000 ppm and after 6 weeks exposure to 5000 ppm. Thirty percent of the mice also succumbed during four weeks exposure to 5000 ppm CH_2Cl_2. Although rats survived 14 weeks exposure to 5000 ppm, they experienced subnormal weight gains. Significant gross and histopathological hepatic lesions were noted in all 3 species at death or experimental termination in 14 weeks. In addition, rats showed abnormal kidney histopathology. Fat stains disclosed mild fatty increase in monkey livers after 14 weeks exposure to 1000 ppm CH_2Cl_2. Author

N72-28052# Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex.

THE EFFECTS OF EXHAUSTIVE EXERCISE ON RATS AT VARIOUS TIMES FOLLOWING BLAST EXPOSURE

John T. Yelverton, John F. Viney, Ben Jojola, III, and Robert K. Jones Washington Defense Nucl. Agency 1 Apr. 1971 34 p refs

(Contract DA-49-146-XZ-359)

(AD-731395; DASA-2707) Avail: NTIS HC $3.75 CSCL 06/3

A series of four swim experiments using a 20 C water bath was conducted with female, albino rats, Sprague Dawley strain. The purpose of the study was to: (1) investigate the effects of exhaustive exercise on rats at various times after exposure to airblast, (2) determine a time when exercise ceases to influence the mortality of blast-injured animals, and (3) estimate the recovery time required after blast trauma before maximum or near-maximal exercise capability is restored. It was found that rats which were forced to swim to exhaustion as late as 1 hour following exposure exhibited a fourfold increase in lethality over nonexercised rats exposed to the same blast levels, and that exercise continued to exert an influence on blast lethality at 4 hours following exposure. However, the added stress of swimming did not increase lethality at 24 hours or 7 days. In addition, a near-normal swim performance was apparent at 7 days after traumatization. Author

N72-28053*# Scientific Translation Service, Santa Barbara, Calif.

ENDOCRINOLOGY: THE EFFECT OF AGE ON HYPOCALCEMIA AND HYPOPHOSPHATEMIA

G. Milhaud, A. Perault-Staub, and M. S. Moukhtar Washington NASA Jul. 1972 8 p refs Transl. into ENGLISH from Compt. Rend., Ac-Ad. Sci., Ser. D (Paris), v. 264, 4 Jan. 1967, p 110-113

(Contract NASw-2035)

(NASA-TT-F-14358) Avail: NTIS HC $3.00 CSCL 06P

The injection of thyrocalcitonine (TCT) provokes considerable hypocalcemia and hypophosphatemia in growing rats. These effects are linked to the intensity of bone catabolism and are much weaker in adult animals. Author

N72-28054*# Scientific Translation Service, Santa Barbara, Calif.

PHYSIOLOGY: THE EFFECT OF THYROCALCITONINE ON THE RENAL EXCRETION OF SODIUM AND CHLORIDES IN NORMAL MAN

R. Ardaillou, G. Milhaud, F. Rousselet, P. Vuagnat, and G. Richet Washington NASA Jul. 1972 7 p refs Transl. into ENGLISH from Compt. Rend., Ser. D (Paris), v. 264, 1967 p 3037-3040

(Contract NASw-2035)

(NASA-TT-F-14356) Avail: NTIS HC $3.00 CSCL 06P

A partially purified thyrocalcitonine preparation provokes increased urinary sodium and chloride excretion in man. This phenomenon is related to the diminished tubular reabsorption of these two ions, independent of endogenous aldosterone or parathormone. Statistical analysis demonstrates that the increased urine sodium level is independent of the urine calcium increase. Author

N72-28055*# Scientific Translation Service, Santa Barbara, Calif.

EVOLUTION OF THE ENDOGENOUS METABOLISM OF

BAKER'S YEAST (SACCHAROMYCES CEREVISIAE) AS A FUNCTION OF THE NATURE OF THE OXIDIZED EXOGENOUS SUBSTRATE (ACETATE, ETHANOL OR GLUCOSE)
Michele Iscaki Washington NASA Jul. 1972 8 p refs Transl. into ENGLISH from C. R. Soc. Biol. (Paris), v. 165, 1971 p 804-807
(Contract NASw-2035)
(NASA-TT-F-14359) Avail: NTIS HC $3.00 CSCL 06M

The oxidation of increased concentrations of acetate and ethanol on the endogenous metabolism of yeast is studied. These results are compared with those obtained in the presence of glucose. Author

N72-28056*# Scientific Translation Service, Santa Barbara, Calif.
FACTORS THAT MODIFY THE BIOSYNTHESIS OF SATURATED FATTY ACIDS IN THE ENDOPLASMIC RETICULUM
Rodolfo R. Brenner, Angel Catala, and Sarah Actic Dato Washington NASA Jul. 1972 12 p refs Transl. into ENGLISH from Acta Cient. Venezolana (Caracas), v. 22, suppl. 2, 1971 p 143-146
(Contract NASw-2035)
(NASA-TT-F-14357) Avail: NTIS HC $3.00 CSCL 06P

The effect of different factors upon fatty acid desaturation in the endoplasmic reticulum was studied and compared. The factors that modify the fatty acid desaturation are: competition among different fatty acids, competition between desaturation and transacylation of lipids, ATP, fasting, carbohydrates and proteins in the diet, diabetes and insulin. Besides, it was also found that the desaturation of fatty acids follows a circadian rhythm. Author

N72-28057*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SURVIVAL OF BACTERIAL ISOLATES EXPOSED TO SIMULATED JOVIAN TRAPPED RADIATION BELT ELECTRONS AND SOLAR WIND PROTONS
D. M. Taylor, C. A. Hagen (Bionetics Corp., Pasadena, Calif.), G. M. Renninger (Bionetics Corp., Pasadena, Calif.), G. J. Simko (Bionetics Corp., Pasadena, Calif.), C. D. Smith (Bionetics Corp., Pasadena, Calif.), and J. A. Yelinek (Bionetics Corp., Pasadena, Calif.) 1972 16 p refs Presented at the Joint Open Meeting of the Panel on Planetary Quarantine and Working Group 5, 15th Planetary Meeting of COSPAR, Madrid, 10-24 May 1972 Prepared in cooperation with Bionetics Corp., Pasadena, Calif.
(Contract NAS7-100)
(NASA-CR-127568; PQ-7) Avail: NTIS HC $3.00 CSCL 06M

With missions to Jupiter, the spacecraft will be exposed for extended duration to solar wind radiation and the Jovian trapped radiation belt. This study is designed to determine the effect of these radiation environments on spacecraft bacterial isolates. The information can be used in the probability of contamination analysis for these missions. A bacterial subpopulation from Mariner Mars 1971 spacecraft (nine sporeforming and three nonsporeforming isolates) plus two comparative organisms, Staphylococcus epidermidis ATCC 17917 and a strain of Bacillus subtilis var. niger, were exposed to 2-, 12-, and 25-MeV electrons at different doses with simultaneous exposure to a vacuum of 0.0013 N/sqm at 20 and -20 C. The radioresistance of the subpopulation was dependent on the isolate, dose, and energy of electrons. Temperature affected the radioresistance of only the sporeforming isolates. Survival data indicated that spores were reduced approximately 1 log/1500 J/kg, while nonsporeforming isolates (micrococci) were reduced 1.5 to 2 logs/1500 J/kg with the exception of an apparent radioresistant isolate whose resistance approached that of the spores. The subpopulation was found to be less resistant to lower energy than to higher energy electrons. Author

N72-28058*# Minnesota Univ., Minneapolis. School of Public Health.
ENVIRONMENTAL MICROBIOLOGY AS RELATED TO PLANETARY QUARANTINE Semiannual Progress Report
Irving J. Iflug Dec. 1971 84 p
(Grant NGL-24-005-160)
(NASA-CR-127633; SAPR-7) Avail: NTIS HC $6.25 CSCL 06M

The results of studies to determine the effect of soil particle size on the survival time at 125 C of the microflora associated with these particles are discussed. The data suggest that longer survival times exist for the microflora associated with larger particles. The studies indicate that microorganisms associated with soil are difficult to kill and that organisms associated with large particles are harder to kill than those associated with small particles. Sterlization requirements increase as the level of contamination increases. Soil particles and their accompanying microflora are the most critical contaminants. Author

N72-28059*# Naval Aerospace Medical Research Lab., Pensacola, Fla.
ALTERED SUSCEPTIBILITY TO MOTION SICKNESS AS A FUNCTION OF SUBGRAVITY LEVEL
Earl F. Miller, II and Ashton Graybiel 23 Nov. 1971 20 p refs
(NASA Order T-81633; NASA Order L-43518)
(NASA-CR-127687; NAMRL-1150) Avail: NTIS HC $3.00 CSCL 06S

Large interindividual differences among 74 normal subjects in the change in susceptibility to motion sickness with effective lifting of the normal g-load by parabolic flight maneuvers were recorded with high test-retest reliability. Most subjects, who were required to make standardized head movements while seated in a chair rotating at a constant speed, demonstrated either a substantial increase or a decrease in susceptibility, in confirmation of a previous study, while a few appeared to be more or less unaffected by the 1 g to 0 g gravitational change. A similar test procedure conducted with eighteen of the subjects at lunar- and Martian-gravity levels revealed further interindividual differences in susceptiblity as a function of g-level. The subjects with gravity-dependent susceptibility revealed: (1) a progressive change in susceptibility as a function of g-load in either the positive or negative direction that was characteristic of the individual, (2) a susceptibility level that appeared to be maintained at the fractional g-load, and (3) immunity to motion sickness at all g-levels tested below the earth standard. The case history as well as ground-based functional and provocative tests of normal subjects proved to be inadequate in predicting susceptibility to motion sickness under subgravity conditions. Author

N72-28060*# Naval Aerospace Medical Research Lab., Pensacola, Fla.
RHESUS MONKEY HEART RATE DURING EXERCISE
John deLorge and John S. Thach, Jr. Apr. 1972 15 p refs
(NASA Order L-27432)
(NASA-CR-127696) Avail: NTIS HC $3.00 CSCL 06C

Various schedules of reinforcement and their relation to heart rates of rhesus monkeys during exercise are described. All the reinforcement schedules produced 100 per cent or higher increments in the heart rates of the monkeys during exercise. Resting heart rates were generally much lower than those previously reported, which was attributed to the lack of physical restraint of the monkeys during recording. Author

N72-28061# Joint Publications Research Service, Arlington, Va.
BIOCHEMICAL ASPECTS OF THE BIOLOGICAL EFFECT OF A LOW FREQUENCY PULSED ELECTROMAGNETIC FIELD
F. A. Kolodub and G. I. Yevtushenko 24 Jul. 1972 9 p refs Transl. into ENGLISH from Gig. Tr. Proj. Zabol. (Moscow), no. 6, 1972
(JPRS-56583) Avail: NTIS HC $3.00

The effect of a low frequency pulsed electromagnetic field (LFPEF) of varying tension on the carbohydrate energy and nitrogen body metabolism was investigated. The action of the field was found to produce marked disturbances in these types of metabolism in the brain, liver, heart and skeletal muscles.

Under the effect of LFPEF macroergic compounds become deficient due to disjunction of the oxidative phosphorylation processes and deranged metabolism of carbohydrates. As regards the nitrogen metabolism the action of LFPEF brings about an intensification of the ammonia formation processes in the absence of correspondingly more vigorous processes of its elimination. A study of enzymatic reactions attended by the formation and elimination of ammonia made it possible to elucidate peculiar features of disorders in the transformation of the nitrogen metabolites in each of the organs studied. Author

N72-28062# Royal Aircraft Establishment, Farnborough (England).
THE CRISIS OF SIGNIFICANCE TESTS IN PSYCHOLOGY
Gernot Kleiter Jun. 1972 32 p refs Transl. into ENGLISH from Jahrb. Psychotherapie und Med. Anthropol., (West Germany), no. 17, 1969 p 144-163
(RAE-Lib-Trans-1649; BR-29646) Avail: NTIS HC $3.75

The role and limitations of statistical hypothesis-testing in psychology are discussed. In particular, tests of significance level are seen to be capable only of refuting a precisely defined hypothesis; they are no substitues for insight and creative thought. One should recognize and use subjective judgment (in a Bayesian sense) before commencing investigations, and remain aware that subsequent tests of data are similarly shaped by subjective impressions. Author

N72-28063*# Houston Univ., Tex. Coll. of Optometry.
THE HUMAN, PRIMATE AND RABBIT ULTRAVIOLET ACTION SPECTRA
Donald Graves Pitts and William Donald Gibbons 31 Mar. 1972 59 p refs Submitted for publication
(Contract NAS9-10836)
(NASA-CR-115742) Avail: NTIS HC $5.00 CSCL 06C

A 5000 watt xenon-mercury high pressure lamp was used to produce a continuous ultraviolet spectrum. Human and animal exposures were made to establish the photokeratitis threshold and abiotic action spectrum. The lower limit of the abiotic action spectrum was 220 nm while the upper limit was 310 nm. The radiant exposure threshold at 270 nm was 0.005 watts/sq cm for the rabbit, 0.004 watts/sq cm for the primate, and 0.004 watts/ sq cm for the human. The rabbit curve was bi-peaked with minimums at 220 nm, 240 nm and 270 nm. The primate curve was tri-peaked with minimums at 220 nm, 240 nm and 270 nm. The human data showed a rather shallow curve with a minimum at 270 nm. Formulas and calculations are given to predict minimum exposure times for ocular damage to man in outer space, to establish valid safety criteria, and to establish protective design criteria. Author

N72-28064# Brookhaven National Lab., Upton, N.Y.
COMPARISON OF TECHNIQUES FOR THE TOTAL-BODY NEUTRON ACTIVATION ANALYSIS OF CALCIUM IN MAN
S. H. Cohn, R. G. Fairchild, and K. K. Shukla 1972 22 p refs Presented at Symp. on Dosimetry Tech. Appl. to Agr., Ind., Biol., and Med., Vienna, 17 Apr. 1972
(BNL-16659; Conf-720411-2) Avail: NTIS

The Ca-48 (n1gamma)Ca-49 reaction of partially moderated 14-MeV neutrons was used along with a bi-lateral exposure in three techniques developed for measuring whole-body calcium in man. A uniform thermal neutron distribution through the body and uniform counting sensitivity of a whole-body counter are essential. NSA

N72-28065# Brookhaven National Lab., Upton, N.Y. Medical Research Center.
NEUTRON SOURCES, ENERGY, FLUX DENSITY, AND MODERATION IN TOTAL BODY NEUTRON ACTIVATION ANALYSIS
S. H. Cohn, R. G. Fairchild, and K. K. Shukla 1972 22 p refs Presented at Symp. on Dosimetry Tech. Appl. to Agr., Ind., Biol., and Med., Vienna, 17 Apr. 1972
(BNL-16658; Conf-720411) Avail: NTIS

The factors involved in achieving uniform irradiation of the target element in human subjects and the radiation dose received by the patient, as related to those factors, are considered. The factors include: neutron sources, energy, flux density distribution, and moderators. NSA

N72-28066# Johns Hopkins Univ., Baltimore, Md. Dept. of Biomedical Engineering.
PERIPHERAL CODING OF ACOUSTIC STIMULI Progress Report, 1 Jan. 1971 - 1 Jan. 1972
Murray B. Sachs, R. H. Lewis, and E. D. Young Feb. 1972 31 p refs
(AF Proj. 9777)
(AD-738337; AFOSR-72-0564TR) Avail: NTIS CSCL 06/16

Results from measurement of effects of sounds of varying frequency and loudness on the firing rate in auditory nerves correlates well with hearing effects on humans after exposure to loud sounds. Four papers have been prepared and two more are in preparation on the results obtained measuring the nerve responses in the auditory nerve in response to controlled tones. The results have made an advance in understanding how the ear encodes signals for transmission by the auditory nerves to the brain. Author (GRA)

N72-28067# Human Engineering Labs., Aberdeen Proving Ground, Md.
SELECTIVE ATTENTION: A SELECTIVE REVIEW
Andrew A. Monjan and Zoltan Annau Dec. 1971 62 p refs
(AD-738131; HEL-TM-26-71) Avail: NTIS CSCL 05/10

The literature on attention and related topics has increased voluminously in recent years. This review on selective attention deals only with limited aspects of the area. It is in two parts. The first part deals with one aspect of selective attention, as exemplified by the dichotic listening task. Experimental work and theoretical models, published since 1960, are reviewed and some suggestions for future work in this area are included. The second part deals with various neurophysiological mechanisms which have been proposed as involved in the process of selective attention. Various models are reviewed, particularly work published since 1906, with emphasis on data derived from human experiments, in so far as possible. Author (GRA)

N72-28068# Wake Forest Coll., Winston-Salem, N.C. Bowman Gray School of Medicine.
EVALUATION OF CEREBRAL AND SYSTEMIC VASCULAR DYNAMICS IN RESPONSE TO STRESS (2) Final Report
Henry S. Miller Feb. 1972 8 p
(Contract DA-49-193-MD-2794)
(AD-737747) Avail: NTIS CSCL 06/19

The project was instituted in July, 1965 to investigate the vascular dynamics under stress conditions. Transducer techniques for obtaining direct and indirect measurements of the physiological variables under investigation and mathematical techniques for the computer analysis of this data have been developed. A 6 Channel recorder has been modified for 6 Channel electrocardiogram recording at rest and during active exercise. Atrial pacing, treadmill exercise and drug injections have been used as methods of stressing the cardiovascular system. The electrocardiogram, apexcardiogram, carotid pulse waves, phonocardiography and blood pressures have been done before and after exercise. In patients with known coronary artery disease, intra-arterial pressures, electrocardiogram, and clinical evidence of cerebral and coronary insufficiency are recorded during the stress by rapid atrial pacing. GRA

N72-28069# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PHYSIOLOGICAL AND PERFORMANCE EFFECTS ON THE AIRCREW DURING LOW-ATTITUDE HIGH-SPEED FLIGHT MISSIONS
Henning E. Vongierke Nov. 1971 41 p refs Presented at the

AGARD Guidance and Control Panel Meeting on Low-Altitude Flight Control Probl., Brussels, 1-3 Sep. 1970
(AF Proj. 7231)
(AD-737827; AMRL-TR-70-67) Avail: NTIS CSCL 06/19

Operational experience as well as flight and simulator experiments indicate that low altitude high speed flying constitutes a nonspecific stress resulting in adverse physiological responses, cumulative fatigue and potentially detrimental effects on selected performance capabilities. Psychological mission stress and pilot workload are hard to separate from the combination of physical stressors, such as buffeting, noise, and heat. Recent studies on the combined effects of noise and vibration on visual and psychomotor performance will be reviewed. As guidance for the evaluation of operational situations the proposed international standard for the evaluation of vibration environments with respect to health, pilot performance, fatigue, and comfort is reviewed. Research goals of ongoing programs in several countries are directed toward reducing environmental stresses and toward refining guidelines with respect to human psycho-physiological responses to these stressors. Promising new approaches appear to rest in the application of modern control theory to describe man-machine effectiveness under environmental stress. Only such adequate descriptions of the physiological state and operational effectiveness of the man would allow future aircraft and weapons systems to be designed with optimum efficiency and effectiveness. Author (GRA)

N72-28070# Texas Christian Univ., Fort Worth. Inst. for the Study of Cognitive Systems.
VARGUS PATTERN SYNTHESIS TECHNIQUES AND THEIR APPLICATIONS
Michael Abbamonte and Selby H. Evans Nov. 1971 132 p refs
(Contract DAAD05-68-C-0176; DA Proj. 1T0-61102-B-81-A)
(AD-738174; HEL-TM-21-71) Avail: NTIS CSCL 05/10

This document describes a collection of computer programs developed for use in research on human pattern perception. The overall orientation which guided the development of the VARGUS (Variable Generator of Unfamiliar Stimuli) pattern-generation programs and the historical backgrounds of each category (VARGUS 7, 9 and 10) are related in the first section. The second section provides documentation, sample output and summary for each program and subroutine. GRA

N72-28071# Human Engineering Labs., Aberdeen Proving Ground, Md.
AN ANNOTATED BIBLIOGRAPHY OF THE LITERATURE DEALING WITH THE PHYSIOLOGICAL CORRELATES OF ATTITUDES AND ATTITUDE CHANGE
Nicholas J. Carriero and Edward C. Gehringer Dec. 1971 96 p refs
(AD-739505) Avail: NTIS CSCL 05/10

The bibliography is an annotated collection of 798 references dealing with the physiological correlates of attitudes and attitude change. The major portion of the items are from the period extending from 1949 to 1970. The items are arranged in alphabetical order by author. Author (GRA)

N72-28072# Army Medical Research Lab., Fort Knox, Ky.
ULTRASONIC MEASUREMENTS OF THE LIVING PRIMATE EYE: THE EFFECTS OF TRANSDUCER MANIPULATIONS Interim Report
Gregory W. Lewis 15 Dec. 1971 25 p refs
(DA Proj. 3A0-61102-B-71P)
(AD-738587; USAMRL-957) Avail: NTIS CSCL 06/16

The effects of ultrasonic transducer manipulations on optical component depth and component interface amplitudes in the live primate eye were investigated. Statistical evidence is presented which suggests that as the ultrasound beam traverses the optical components of refraction, increased variability in depth and amplitude measures occur. Angular transducer displacement from the criterion 'standard trace' has a greater effect on depth and amplitude measures than did linear displacement from the 'standard trace'. The most sensitive amplitude measure was that of the front lens. Optical component depth measures were much less sensitive to transducer movement than were component amplitude measures. Author (GRA)

N72-28073# Army Medical Research Lab., Fort Knox, Ky.
MODELS OF HEAT DISSIPATION IN A HOMOGENEOUS SOLID Final Report
Craig R. Heimbach 18 Nov. 1971 20 p refs
(AD-738589; USAMRL-954) Avail: NTIS CSCL 06/18

Previous theoretical calculations of thermal damage resulting from irradiation have used equations involving the time-temperature history of the material. These models assumed uniform beams of radiation. This report extends the range of models available to include a more realistic application to non-uniform beams. Author (GRA)

N72-28074# Naval Submarine Medical Center, Groton, Conn.
THE TIME COURSE OF ACID BASE BALANCE WHILE ON FBM SUBMARINE PATROL
Alexander S. Peck, Jr. 28 Jul. 1971 12 p refs
(AD-738809; NSMRL-675; NAVMED-MR011.01-5033-01)
Avail: NTIS CSCL 06/19

Measurements of arterialized capillary, and venous pH, PCO2 and PO2 were taken from 15 healthy male subjects during a control period and during days 2, 9, 17, 42 and 56 of a Polaris submarine patrol. Venous plasma concentrations of sodium, chloride, and potassium were determined from frozen samples. Twenty-four hour urine specimens were collected from four of the men in the study. Daily excretion of sodium, potassium, calcium, and phosphate were determined by analysis of frozen samples. The men were on normal diets with no restrictions or control of calcium intake. Despite prolonged exposure to elevated levels of CO2 (.72% to .95% with a mean of .85%), no significant respiratory acidosis was documented. Plasma electrolytes were clinically normal and gave no evidence of acidosis during the study and post recovery period. Urinary excretion of calcium, phosphate, sodium, and potassium were within normal limits. The direct on-board measurement of blood gas and pH values shows little physiological change at present operational levels of CO2. Author (GRA)

N72-28075# Naval Air Development Center, Johnsville, Pa. Crew Systems Dept.
ELECTRORETINOGRAPHIC EVALUATION OF THE BUNSEN-ROSCOE LAW FOR THE HUMAN EYE AT HIGH ENERGY LEVELS Interim Report
Robert A. Rosenblum 7 Jul. 1971 20 p refs
(MF12524004)
(AD-738803; NADC-CS-7101) Avail: NTIS CSCL 06/16

The amplitude of the a-wave of the human electroretinogram is shown to obey the intensity-time relation of the Bunsen-Roscoe Law at very suprathreshold energy levels. This implies that retinal receptor cells are capable of temporal light integration at these energies. Failure to demonstrate the photochemically predicted intensity-time reciprocity failure may represent insufficient flash stimulus energy. The latency of the b-wave response is shown to be dependent on flash duration at constant energy, increasing as duration increases. Author (GRA)

N72-28076# Naval Air Development Center, Johnsville, Pa. Crew Systems Dept.
INCREMENT THRESHOLDS FOR TWO NONIDENTICAL FLASHES Interim Report
Robert M. Herrick and Charles J. Theisen, Jr. 22 Nov. 1971 59 p refs
(MF12524004)
(AD-739327; NADC-CS-7120) Avail: NTIS CSCL 05/10

Two flashes of 1 degree visual angle and 0.389 mL were superimposed upon a steady 1.19 mL background of the same size seen foveally. The second flash followed the first after delays ranging from 0 to 60 ms. The duration of the first flash

was varied from 0 to 4.8 ms, and, for each duration of the first flash, the threshold duration of the second flash was determined. (When seen, the two flashes appeared as one.) At all delays below 25 ms, the threshold energy of the two flashes combined was constant, regardless of the duration of the first flash. At each delay between 25 and 50 ms, at short durations of the first flash, the threshold duration of the second flash was the same as that required when no first flash was presented. However, at longer durations of the first flash, the threshold average luminance provided by the two flashes during the total display time was constant. At the delay that required the maximum energy for threshold, 55 ms, for every duration of the first flash, the duration of the second flash was greater than that required when no first flash was presented. These findings, and others, are incorporated in a simple model. Author (GRA)

N72-28077# Tulane Univ., New Orleans, La. Biomechanics Lab.
A CONTINUUM MODEL OF THE PRIMATE BODY RESPONSE TO IMPACT Final Report, 1 Jun. 1970 - 31 Aug. 1971
Y. King Liu, Stephen C. Cowin, D. U. VonRosenberg, and Kenneth A. Adams Jan. 1972 100 p refs
(Contract F33615-70-C-1565; AF Proj. 7231)
(AD-739249; AMRL-TR-71-99) Avail: NTIS CSCL 06/19

A continuous configuration model of the spine under axial dynamic impact is derived from first principles. The model consists of an initially curved beam-column subjected to eccentric inertial loading. As long as the formulation remains tractable, the assumptions of large deflections and finite strains are retained. Otherwise, the results are specialized to large deflections but small strains and then to small deflections and strains. The emphasis of this derivation is on the basic assumptions leading to the partial differential equations of motions. A comparison with the variational method of formulation is also given. Some previous investigations are shown to be special cases of the present model. Numerical analysis and results using the finite-difference technique are given for three special cases of the model. Feasibility studies were conducted to determine the extent and degree of detail of the biomechanical data needed to implement the model. These studies on the means of obtaining the inertial property distribution of the human trunk, the material property distribution and the failure criterion of the intervertebral joints, showed conclusively that such data indeed can be found. However, before a regression analysis can be made to yield useful input data, a fairly large experimental effort is needed.
Author (GRA)

N72-28078# School of Aerospace Medicine, Brooks AFB, Tex.
CEREBRAL CORTEX POTENTIALS EVOKED IN MAN BY PERCEIVED AND NOT PERCEIVED ACOUSTIC STIMULI
E. A. Konstandov and G. I. Dyachkova 1972 14 p refs Transl. into ENGLISH from Neurophysiology (USSR), v. 3, 1971
(AD-739270; SAM-TT-R-1124-0372) Avail: NTIS CSCL 06/16

With the aid of the computer, average evoked potentials (AEP) to short acoustic subliminal stimuli (3-10 db below the threshold audibility), liminal intensity and supraliminal intensity (10-60 db above the threshold) were recorded from the vertex and the occipatal region of the skull (healthy subjects). The dynamics of the AEP changes have been demonstrated with an increase in sound intensity from subliminal to supraliminal (60 db) values. Time and amplitude parameters of AEP from perceived and not perceived acoustic stimuli are positively distinguishable from each other. A long-latent, low-amplitude, slow positive wave is the most constant, and in many cases the only component of AEP from a not perceived stimulus.
Author (GRA)

N72-28079# National Academy of Sciences-National Research Council, Washington, D.C. Committee on Hearing, Bioacoustics, and Biomechanics.
SUSTAINED LINEAR ACCELERATION
James P. Henry, Randall M. Chambers, Otto H. Gauer, Ernest P. McCutcheon, and Laurence R. Young Mar. 1972 24 p Presented at the meeting of the Working Group 67, Cocoa Beach, Fla., 1 Apr. 1971
(Contract N00014-67-A-0244-0211; NR Proj. 140-113)
(AD-738478) Avail: NTIS CSCL 06/19

The report concerns modern and future fighter aircraft with maneuvering capabilities that now are beginning to exceed the G force limitations of man, particularly with regard to such effects on man's pulmonary, cardiovascular, and labyrinthine systems. Protective mechanisms are discussed that have potential for exceeding man's unprotected tolerance; research at many laboratories is discussed. The report considers that 9 G 30-sec duration acceleration is likely to be tolerable and that the solution will probably involve a compromise between posture, straining, pilot selection, and anti-G suits rather than the use of any single technique exclusively. Twelve fruitful research areas are outlined for future laboratory effort. Author (GRA)

N72-28080# New York Univ., N.Y. Dept. of Industrial Engineering and Operations Research.
EVOKED CORTICAL POTENTIALS AND INFORMATION PROCESSING Annual Summary Report, 1 Apr. 1971 - 31 Mar. 1972
John L. Andreassi and Mark S. Mayzner 31 Mar. 1972 78 p refs
(Contract N00014-67-A-0467-0009)
(AD-738964; Rept-0-5511-356-3; ASR-3) Avail: NTIS CSCL 06/16

The report summarizes the work performed and data collected in the Psychophysiology section of the Human Factors Laboratory, New York University, from 1 April 1971 through 31 March 1972. Six experiments were conducted. The first study was concerned with visual evoked potentials (VEPs) and detection performance under conditions of four-digit overprinting. In the second experiment overprinting was studied again in a situation in which the third stimulus in the digit string was now of higher luminance than the others. Experiment III studied visual and auditory cortical evoked potentials under conditions of single and bimodal stimulation. The fourth experiment was concerned with the question of whether increasingly intense auditory stimuli would produce evoked responses in the visual area. Experiments V and VI were conducted to study the effects of geometric form upon the VEP. In experiment V the stimuli were simple lines oriented three different planes and in experiment VI VEPs to two different geometric forms (square and triangle) were studied.
Author (GRA)

N72-28081# Memphis State Univ., Tenn. Dept. of Psychology.
CONVENTIONAL AND HIGH FREQUENCY HEARING OF NAVAL AIRCREWMEN AS A FUNCTION OF NOISE EXPOSURE Technical Report, May 1971 - Mar. 1972
John L. Fletcher 1 Apr. 1972 13 p refs
(Contract N00014-71-C-0354)
(AD-739368; HRL/1) Avail: NTIS CSCL 06/19

Conventional and high frequency audiograms for US Navy prop, jet, and rotary wing pilots were obtained and plotted as a function of amount of flight time logged. Lack of sufficient audiograms of prop and rotary pilots restricts discussion of the relative hazard to hearing of prop, rotary, and jet flight. However, for jet aircrewmen, losses appear to begin at the higher frequencies i.e., above 6 KHz, and erode with cumulative flight time down to the lower frequencies. Percent of persons detecting the high frequency signals is a more precise index of the progression of hearing loss than is mean hearing level, primarily because of an artifact in scoring audiograms. Data collection of aircrew candidates pre-training, during training, and post-primary hearing are concurrently being collected by US Navy Aerospace Medical Research Institute (NAMI) personnel at Pensacola NAS. Author (GRA)

N72-28082# Naval Medical Research Inst., Bethesda, Md.
EFFECTS OF BREATHING AIR AND HELIUM-OXYGEN AT SEVERAL DEPTHS ON RESPONSE RATES IN MULTIPLE

SCHEDULES Medical Research Progress Report
John R. Thomas, J. Michael Walsh, and Arthur J. Bachrach 30 Dec. 1971 29 p refs
(AD-739690; NAVMED-MF12.524.004-7007D-1) Avail: NTIS CSCL 06/19

Albino rats, trained on a multiple fixed-ratio (FR), differential reinforcement of low rate (DRL) schedule for food reinforcement were repeatedly exposed to increased pressure (equivalent to 100, 200, and 300 feet of sea water) breathing compressed air or an 80% helium-20% oxygen mixture (Heliox). Response rates on the two schedules were less disrupted when the heliox mixture was used, although decrements in performance were still observed. Repeated exposure to the same depths produced some behavioral adaptation to pressure effects. Differential rate changes on the two schedules under hyperbaric conditions were observed as a function of schedule contingencies. Author (GRA)

N72-28083# Ocean Systems, Inc., Tarrytown, N.Y. Research and Development Dept.
MECHANISM AND DETECTION OF DECOMPRESSION SICKNESS
Mitchell R. Powell 15 Dec. 1971 70 p refs
(Contract N00014-69-C-0346)
(AD-739700; UCRI-673) Avail: NTIS CSCL 06/19

The report describes investigations of the use of ultrasound techniques for the study of mechanisms and detection of decompression sickness. The theoretical and experimental basis of through-transmission ultrasound detection of bubbles in a biological system is discussed and compared to Doppler, pulsed-echo, and acoustic-optical imaging techniques. The course of development of decompression sickness symptoms and of visible bubbles in the circulatory system was compared to ultrasonic signal attenuation measurements for similar decompression conditions. Parameters of ultrasound signal attenuations--time to attain an effect, rate of change to maximum effect, magnitude of maximum effect, and time to recover the original signal-paralleled the manifestation of corresponding parameters of decompression sickness symptoms. Visible intravascular bubbles, primarily in the venous system, were found in animals exhibiting a range of decompression symptoms from mild or none to severe or death but were seldom seen after about one hour past decompression. Arterial bubbles on the other hand, were often seen in animals which died from decompression and only occasionally in animals which survived. GRA

N72-28084# Indiana Univ., Bloomington.
PHYSIOLOGICAL ADJUSTMENTS OF MEN TO WORK AND HEAT Final Technical Report, Jul. 1963 - Jun. 1971
Sid Robinson 18 Mar. 1972 84 p refs
(Contract DA-49-193-MD-2449)
(AD-739838) Avail: NTIS CSCL 06/19

Studies of temperature regulatory adjustments of man in relation to variations in the distribution of heat in the body, i.e., the vertical and longitudinal temperature gradients in the limbs, the core and surface temperature changes of the trunk, which occur following abrupt changes in the environmental temperature and/or the energy metabolism activity of the subject. The levels of response under various steady state conditions were also evaluated. Author (GRA)

N72-28085# Office of Naval Research, London (England).
SYMPOSIUM ON THE EFFECTS OF PRESSURE ON ORGANISMS
Ralph R. Sonnenschein 22 Feb. 1972 12 p refs Conf. held at Bangor, Whales, 6-10 Sep. 1971
(AD-740094; ONRL-C-5-72) Avail: NTIS CSCL 06/19

At the Symposium on the Effects of Pressure on Organisms, held in Bangor, Wales on 6-10 September 1971, effects of high pressure on physiocochemical systems and on a wide variety of plant and animal forms were discussed as well as anatomical and physiological adaptations of living forms to pressure and submersion. Author (GRA)

05 BIOTECHNOLOGY

Includes life support systems, human engineering, protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N72-28086*+ Beckman Instruments, Inc., Fullerton, Calif. Advanced Technology Operations.
WHITE BLOOD CELL COUNTING SYSTEM Final Report
15 Jul. 1972 19 p
(Contract NAS9-12371)
(NASA-CR-115706; FR-1089-101) Avail: NTIS HC $3.00 CSCL 06B

The design, fabrication, and tests of a prototype white blood cell counting system for use in the Skylab IMSS are presented. The counting system consists of a sample collection subsystem, sample dilution and fluid containment subsystem, and a cell counter. Preliminary test results show the sample collection and the dilution subsystems are functional and fulfill design goals. Results for the fluid containment subsystem show the handling bags cause counting errors due to: (1) adsorption of cells to the walls of the container, and (2) inadequate cleaning of the plastic bag material before fabrication. It was recommended that another bag material be selected. Author

N72-28087*# General Dynamics/Convair, San Diego, Calif.
LIFE SCIENCES PAYLOAD DEFINITION AND INTEGRATION STUDY. VOLUME 1: MANAGEMENT SUMMARY
Mar. 1972 36 p
(Contract NAS8-26468)
(NASA-CR-123738; GDC-DBD72-002-Vol-1) Avail: NTIS HC $4.00 CSCL 06B

The objectives of a study program to determine the life sciences payloads required for conducting biomedical experiments during space missions are presented. The objectives are defined as: (1) to identify the research functions which must be performed aboard life sciences spacecraft laboratories and the equipment needed to support these functions and (2) to develop layouts and preliminary conceptual designs of several potential baseline payloads for the accomplishment of life research in space. Payload configurations and subsystems are described and illustrated. Tables of data are included to identify the material requirements for the space missions. Author

N72-28088*# General Dynamics/Convair, San Diego, Calif.
LIFE SCIENCES PAYLOAD DEFINITION AND INTEGRATION STUDY. VOLUME 2: REQUIREMENTS AND DESIGN STUDIES
Mar. 1972 239 p refs
(Contract NAS8-26468)
(NASA-CR-123739; GDC-DBD72-002-Vol-2) Avail: NTIS HC $14.00 CSCL 06B

For abstract, see N72-28087.

N72-28089*# General Dynamics/Convair, San Diego, Calif.
LIFE SCIENCES PAYLOAD DEFINITION AND INTEGRATION STUDY. VOLUME 3: APPENDICES
Mar. 1972 243 p
(Contract NAS8-26468)
(NASA-CR-123737; GDC-DBD72-002-Vol-3) Avail: NTIS HC $14.25 CSCL 06B

Detail design information concerning payloads for biomedical research projects conducted during space missions is presented. Subjects discussed are: (1) equipment modules and equipment item lists, (2) weight and volume breakdown by payload and equipment units, (3) longitudinal floor arrangement configuration, and (4) nonbaseline second generation layouts. Author

N72-28090*# Bell Aerospace Co., Buffalo, N.Y.
TELEOPERATOR TECHNOLOGY AND SYSTEM DEVELOPMENT, VOLUME 1 Final Report, 1 Mar. 1971 - 28 Feb. 1972
Apr. 1972 205 p
(Contract NAS8-27021)
(NASA-CR-123741; Rept-8586-950001A-Vol-1) Avail: NTIS HC $12.25 CSCL 05H

A two phase approach was undertaken to: (1) evaluate the performance of a general-purpose anthropomorphic manipulator with various controllers and display arrangements, (2) identify basic technical limitations of existing teleoperator designs, and associated controls and displays, and (3) identify, through experimentation, the effects that controls and displays have on the performance of an anthropomorphic manipulator. In Phase 1 the NASA-furnished manipulators, controls and displays were integrated with the remote maneuvering unit; in Phase 2 experiments were defined and performed to assess the utility of teleoperators for 6 typical space inspection, maintenance and repair tasks. Author

N72-28091*# URS/Matrix Co., Huntsville, Ala. Man Systems Div.
DEVELOPMENT OF FLIGHT EXPERIMENT TASK REQUIREMENTS. VOLUME 1: SUMMARY Final Report
G. Richard Hatterick 1 Jun. 1972 31 p refs 2 Vol.
(Contract NASw-2192)
(NASA-CR-127468; PRL-189-Vol-1) Avail: NTIS HC $3.75 CSCL 05H

A study was conducted to develop the means to identify skills required of scientist passengers on advanced missions related to the space shuttle and RAM programs. The scope of the study was defined to include only the activities of on-orbit personnel which are directly related to, or required by, on-orbit experimentation and scientific investigations conducted on or supported by the shuttle orbiter. A program summary is presented which provides a description of the methodology developed, an overview of the activities performed during the study, and the results obtained through application of the methodology. Author

N72-28092*# URS/Matrix Co., Huntsville, Ala. Man Systems Div.
DEVELOPMENT OF FLIGHT EXPERIMENT TASK REQUIREMENTS. VOLUME 2: TECHNICAL REPORT. PART 1: PROGRAM REPORT AND APPENDICES A-G Final Report
G. Richard Hatterick 1 Jun. 1972 194 p 2 Vol.
(Contract NASw-2192)
(NASA-CR-127469; PRL-189-Vol-2-Pt-1) Avail: NTIS HC $11.75 CSCL 05H

Activities are documented of the study to determine skills required of on-orbit crew personnel of the space shuttle. The material is presented in four sections that include: (1) methodology for identifying flight experiment task-skill requirements, (2) task-skill analysis of selected flight experiments, (3) study results and conclusions, and (4) new technology. D.L.G.

N72-28093*# URS/Matrix Co., Huntsville, Ala. Man Systems Div.
DEVELOPMENT OF FLIGHT EXPERIMENT TASK REQUIREMENTS. VOLUME 2: TECHNICAL REPORT. PART 2: APPENDIX H: TASKS-SKILLS DATA SERIES Final Report
G. Richard Hatterick 1 Jun. 1972 992 p 2 Vol.
(Contract NASw-2192)
(NASA-CR-127470; PRL-189-Vol-2-Pt-2) Avail: NTIS HC $51.75 CSCL 05H

The data sheets presented contain the results of the task analysis portion of the study to identify skill requirements of space shuttle crew personnel. A comprehensive data base is provided of crew functions, operating environments, task dependencies, and task-skills applicable to a representative cross section of earth orbital research experiments. D.L.G.

N72-28094*# Cyberfacts, Inc., Sudbury, Mass.
DEVELOPMENT OF A MODEL OF MACHINE HAND EYE COORDINATION AND PROGRAM SPECIFICATIONS FOR A TOPOLOGICAL MACHINE VISION SYSTEM Final Report
30 Jun. 1972 124 p refs
(Contract NASw-2243)
(NASA-CR-127566) Avail: NTIS HC $8.25 CSCL 05H

A unified approach to computer vision and manipulation is developed which is called choreographic vision. In the model, objects to be viewed by a projected robot in the Viking missions to Mars are seen as objects to be manipulated within choreographic contexts controlled by a multimoded remote, supervisory control system on Earth. A new theory of context relations is introduced as a basis for choreographic programming languages. A topological vision model is developed for recognizing objects by shape and contour. This model is integrated with a projected vision system consisting of a multiaperture image dissector TV camera and a ranging laser system. System program specifications integrate eye-hand coordination and topological vision functions and an aerospace multiprocessor implementation is described. Author

N72-28095*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ZERO-GRAVITY OPEN-TYPE URINE RECEPTACLE
Anthony S. Girala Feb. 1972 24 p refs Presented at Conf. on Body Waste Systems for Spacecraft, Hampton, Va., 17 May 1971
(NASA-TM-X-58085; MSC-05813) Avail: NTIS HC $3.25 CSCL 06I

The development of the zero-gravity open-type urine receptacle used in the Apollo command module is described. This type receptacle eliminates the need for a cuff-type urine collector or for the penis to circumferentially contact the receptacle in order to urinate. This device may be used in a gravity environment, varying from zero gravity to earth gravity, such as may be experienced in a space station or space base. Author

N72-28096# Nauka Press, Moscow (USSR).
BIONICS: BIBLIOGRAPHIC INDEX OF THE DOMESTIC AND FOREIGN LITERATURE, 1958-1968
T. N. Anisimova 1971 168 p refs In RUSSIAN
Avail: NTIS HC $10.50

A bibliography is presented on the following aspects of bionics: general bionics and technical modeling of biological systems; (2) receptor mechanisms; (3) orientation, navigation, and location of animals; (4) effects of physical poles and radiation on biological objects; (5) behavior and control of behavior in animals: (6) bionic problems of control and regulation; (7) problems of constructing complex biological-technical systems; (8) bionic problems in pattern recognition; (9) neurobionics; and (10) bionic aspects of cybernetics and mathematical biology. Transl. by K.P.D.

N72-28097*# McDonnell-Douglas Co., St. Louis, Mo.
A POTABLE WATER DISPENSER Patent Application
Herbert R. Cunningham, inventor (to NASA) Filed 28 Jun. 1972 27 p Sponsored by NASA
(NASA-Case-MFS-21115-1; US-Patent-Appl-SN-266930) Avail: NTIS HC $3.00 CSCL 06I

A mechanism for dispensing precisely measured charges of potable water into reconstitution bags is described. The dispenser includes a tubular body with an axially reciprocable piston. The piston is spring-biased toward an end wall forming a chamber intake port, and ejection port. The volume of the chamber is controlled by the position of the head of the piston. The extent to which the piston is displaced for expanding the chamber is controlled by the position of the shaft. Delivery of potable water to and from the chamber is controlled by a rotary valve, while final dispensing of water is controlled by a linear valve which operates in relation to the rotary valve. NASA

N72-28098*# McDonnell-Douglas Co., St. Louis, Mo.
A FLUID DISPENSER Patent Application
Thomas A. Cook and Hans Scheibe, inventors (to NASA) Filed 28 Jun. 1972 22 p Sponsored by NASA
(NASA-Case-MFS-21163-1; US-Patent-Appl-SN-266925) Avail: NTIS HC $3.00 CSCL 06I

A cyclically operable fluid dispenser particularly suited for use in dispensing precisely measured charges of potable water aboard spacecraft is disclosed. The dispenser is characterized by a sealed housing adapted to be held within a crewman's palm and coupled with a pressurized source of potable water, a dispensing jet projected from the housing and configured to be received within a crewman's lips, an expansible measuring chamber for measuring charges of drinking water received from the source, and a dispenser actuator including a lever extended from the housing to be digitated for initiating operational cycles.
NASA

N72-28099# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.
METHODOLOGY IN THE MEASUREMENT OF COMPLEX HUMAN PERFORMANCE: TWO-DIMENSIONAL COMPENSATORY TRACKING
Alan E. Jennings, W. Dean Chiles, and Georgetta West May 1972 9 p refs
(FAA-AM-72-21) Avail: NTIS HC $3.00

Nineteen subjects were tested on two successive days on a complex performance device designed to measure functions of relevance to aircrew performance. Data included measures of monitoring, information processing, pattern discrimination, and group problem solving. The effects of a perceptual motor tracking task were evaluated by measuring performance with and without concurrent tracking during five different task combinations and in a tracking alone condition. The tracking task was shown to be reliable both when performed by itself and when performed concurrently with other tasks. The tracking task was also shown to be sensitive to work load effects from the other tasks and to impose a significant effect on some of the other tasks. The findings also suggest that a composite score based on all concurrently performed tasks may have unique value and sensitivity under some conditions. Author

N72-28100# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.
MULTIPLE TASK PERFORMANCE AS A PREDICTOR OF THE POTENTIAL OF AIR TRAFFIC CONTROLLER TRAINEES
W. Dean Chiles, Alan E. Jennings, Georgetta West, and William T. Abernathy Jan. 1972 32 p refs
(FAA-AM-72-5) Avail: NTIS HC $3.75

Two hundred and twenty-nine air traffic controller trainees were tested on the CAMI multiple task performance battery. The battery provides objective measures of monitoring, arithmetical skills, visual discrimination, and group problem solving. The criterion of trainee potential was based on ratings from FAA Academy instructors in courses being attended by the trainees. Five studies were conducted, the first one (N = 19) being in the nature of a pilot study for checking out procedures. The second study (N = 60) yielded a validity coefficient of .54. The third study (N = 31) yielded a coefficient of .53. The fourth study (N = 30) found no predictive power for the MTPB. The fifth study (N = 89) produced a coefficient of .24 for one method of computing the performance index and .46 for a second method. For each study, the coefficient is based on one hour of testing with about 50 minutes of preceding instruction and practice. It is concluded that the MTPB-approach to selection offers promise as a screening device for air traffic control specialist applicants, but further research is required to establish this as a fact and to determine its utility in terms of cost effectiveness. Author

N72-28101*# Advanced Rocket Technology, Irvine, Calif.
EVALUATION OF ADVANCED COMPONENT CONCEPTS FOR AN INTEGRATED ENVIRONMENTAL CONTROL/LIFE SUPPORT, RESISTOJET CONTROL SYSTEM
Carl R. Halbach, Paul D. Arthur, and Russell J. Page Jun. 1972 78 p refs
(Contract NAS1-10767)
(NASA-CR-112104) Avail: NTIS HC $6.00 CSCL 06K

Flow restricting devices were studied for their suitability as liquid water propellant flow limiters for the biowaste resistojet. Flow limiting during the start-up transient is required to prevent thrustor instabilities and icing which could result in heater failure in the electrical resistance heated thrustor (resistojet). The study was directed toward simple devices which would function passively (i.e., without power except from the propellant flow itself), and would offer high reliability and simplicity. In addition to the flow limiting devices, a thermal pumping system was studied to determine whether CO_2, desorbed from molecular sieves could be pumped thermally in a space station application. The thermal pump is considered a possible replacement for mechanical pumps. It involves a cyclic, constant volume cryopumping system which employs space radiators to achieve the cryotemperatures. The frozen CO_2 would be vaporized periodically, using a waste heat loop, to attain sufficient pressure to transfer a large portion of the trapped CO_2 to storage tanks.
Author

N72-28102# Joint Publications Research Service, Arlington, Va.
SPACE MEDICINE: REPORTS ON ARTIFICIAL GRAVITATION AND SPACE SUITS
25 Jul. 1972 17 p ref Transl. into ENGLISH from Aviats. i Kosmonavt. (Moscow), no. 4, 1972 p 24-25 and 32-33 plus back cover
(JPRS-56598) Avail: NTIS HC $3.00

A report on the ways and means of maintaining the health and workability of man on long voyages in space is given. Specific reference is made to the physiological problems of artificial gravity and experiments conducted with mice and rats. The second part of the report describes the space suit used by astronauts and the various life support systems it contains. For individual titles, see N72-28103 through N72-28104.

N72-28103 Joint Publications Research Service, Arlington, Va.
ARTIFICIAL GRAVITATION AND PHYSIOLOGY
Ye. Yuganov *In its* Space Med.: Repts. on Artificial Gravitation and Space Suits 25 Jul. 1972 p 1-5 ref (For availability see N72-28102 19-05)

Methods designed to help astronauts adjust to weightlessness conditions and the effects of these conditions on physiological processes are discussed. Particular attention was given to creating artificial gravity environments onboard the space ship. Also examined were the minimal amount of acceleration needed to create a relatively effective gravitational environment, the vehicle spin rate that can be safely tolerated by man, and the potentialities of life and activity in systems rotating for prolonged periods. It was suggested that the optimum level of prolonged rotation for man is 10 deg/sec, and the artificial gravity needed to perserve physiological processes and life potentialities range between .28 and .31 G of normal gravity. E.H.W.

N72-28104 Joint Publications Research Service, Arlington, Va.
SPACE SUIT OF AN ASTRONAUT
In its Space Med.: Repts. on Artificial Gravitation and Space Suits 25 Jul. 1972 p 6-14 (For availability see N72-28102 19-05)

A description is given of the space suit worn by astronauts during EVA. The portable life support systems, protective qualities of the suit, and the safety features built into the suit in case of failures are given. E.H.W.

N72-28105# System Development Corp., Santa Monica, Calif.
HUMAN FACTORS IN THE DEVELOPMENT OF AIR TRAFFIC CONTROL AUTOMATION
John M. Daily 1 Apr. 1971 21 p Sponsored by FAA
Avail: NTIS HC $3.25

The importance of integrating personnel or human factor considerations into the process of developing automated air traffic control systems is discussed. It is shown that fundamental to effective system development is a well conceived system engineering plan that contains the human factor aspects of the system. Author

N72-28106# Education and Public Affairs, Washington, D.C.
SELECTION OF AIR TRAFFIC CONTROLLERS FOR FEDERAL AVIATION ADMINISTRATION Final Report
Ann M. Milne and Joseph G. Colmen Jan. 1972 153 p refs
(Contract DOT-FA70WA-2371)
Avail: NTIS HC $9.75

Experiments related to the capacity of tests to predict the quality of job performance of a journeyman air traffic controller produced mixed results. The Civil Service Commission paper-pencil test battery was at best marginal in predicting job performance of journeymen, in spite of the fact that the range of scores obtained by journeymen was broader in general than that obtained by new appointees. Psychomotor tests, on the other hand, displayed consistantly significant correlations with supervisory ratings. A combination of a common battery of paper pencil and psychomotor tests increased accuracy of assignments from 25% to 58%. Analyses dealing with classification in terms of capacity to operate in high or low density facilities revealed large potential operational gains with accuracy levels as high as 75% to 80%. Classification of applicants in terms of density for the two options requires the administration of two additional psychomotor tests beyond those needed for option placement. Author

N72-28107# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Behavioral Sciences Div.
HUMAN ENGINEERING ASSESSMENT OF VFR CABS
L. G. Innes Feb. 1972 15 p refs
(DCIEM-832) Avail: NTIS HC $3.00

The predicted substantial increase in student pilot flying at two CF training bases over the next few years is expected to increase the demands of the VFR controller's task to an unacceptable extent. A human engineering survey of VFR tower cabs on two CF flying training bases was conducted to produce recommendations for interim, low cost modifications which would help in reducing controller workload. Proposals for modifications in equipment, environment and procedures are detailed. Author

N72-28108*# Chemtric, Inc., Rosemont, Ill.
POTABLE WATER BACTERICIDE AGENT DEVELOPMENT Final Report, Jun. - Dec. 1971
T. L. Hurley and R. A. Bambenek Jul. 1972 104 p refs
(Contract NAS9-12104)
(NASA-CR-115595; Rept-3097) Avail: NTIS HC $7.25 CSCL 06K

The results are summarized of the work performed for the development and evaluation of a bactericide agent/system concept capable of being used in the space shuttle potable water system. The concept selected for evaluation doses fuel cell water with silver ions before the water is stored and used, by passing this water through columns packed with silver chloride and silver bromide particles, respectively. Four simulated space shuttle potable water system tests, each of seven days duration, were performed to demonstrate that this concept is capable of delivering sterile water even though 3 + or - 1 x 10 to the 9th power Type IIIa or Pseudomonas aeruginosa bacteria, two types which have been found in the Apollo potable water system, are purposely injected into the system each day. This result, coupled with the fact that silver ions do not have to be periodically added to the stored water, indicates that this concept is superior to the chlorine and iodine techniques used on Apollo. Author

N72-28109# Royal Aircraft Establishment, Farnborough (England).
REPRESENTATION BY MODELS OF THE BIOMECHANICAL SYSTEM MAN-OPERATOR UNDER THE ACTION OF RANDOM VIBRATIONS
B. A. Potemkin and K. V. Frolov Jun. 1972 9 p refs Transl. into ENGLISH from DAN (SSSR), v. 197, no. 6, 1971 p 1284-1287
(RAE-Lib-Trans-1651; BR-29553) Avail: NTIS HC $3.00

In an attempt to determine the place and effect of man in an operator-machine system, tests have been carried out to determine the dynamic characteristics of the human body. Values of the transmission function across the body were calculated, using the autocorrelations and spectral densities of the output and input vibration functions. Representative random oscillations were used and the subjects tested for three postures. Results are given for the characteristic components of the models used for the three postures. Author

N72-28110# Konigsberg Instruments, Inc., Pasadena, Calif.
PROGRAM TO DEVELOP IMPROVED IMPLANTABLE PRESSURE TRANSDUCERS Annual Report, 28 Jun. 1969 - 27 Jun. 1971
Eph. Konigsberg 15 Feb. 1972 129 p
(Contract PHS-69-2241)
(PB-207712; NIH-69-2241-1) Avail: NTIS HC $3.00 CSCL 06B

Improved implantable pressure transducers suitable for both arterial and venous applications have been developed and extensively tested. A gage version of these instruments has also been designed and fabricated. An implantable differential pressure transducer has been designed, and first prototypes tested. A component improvement program for the above devices, including metals, gages, wires, cables and connectors has resulted in greater reliability in usage. Software and test protocols for bench and in vivo calibrations were developed. Author (GRA)

N72-28111# Bunker-Ramo Corp., Westlake Village, Calif. Human Factors Dept.
RELATIONSHIP BETWEEN SYSTEM DESIGN, TECHNICIAN TRAINING AND MAINTENANCE JOB PERFORMANCE ON TWO AUTOPILOT SUBSYSTEMS
David Meister, Dorothy L. Finley, and Ernest A. Thompson Sep. 1971 184 p refs
(Contract F33615-69-C-1320; AF Proj. 1124)
(AD-739591; AFHRL-TR-70-20) Avail: NTIS CSCL 05/5

The purpose of the study was to investigate the relationship between system design and training variables and performance of technicians. Over a five month period technicians at two SAC bases were observed in troubleshooting the MF-1 and A42G autopilots. Following each maintenance incident the technician was interviewed. At the conclusion of the study maintenance supervisors ranked and rated all technicians in terms of skill level. Data collectors also rated the major design characteristics of the equipments maintained. These ratings were correlated with indices of technician performance and subjected to multiple regression analysis. Those factors contributing a significant amount to performance were extracted. A subjective report test battery was also developed to determine whether subjects could predict their own performance. Author (GRA)

N72-28112# General Electric Co., Schenectady, N.Y. Specialty Materials Handling Products Operation.
HARDIMAN 1 PROTOTYPE FOR MACHINE AUGMENTATION OF HUMAN STRENGTH AND ENDURANCE Final Report, May - Aug. 1971
B. R. Fick and John B. Makinson 30 Aug. 1971 29 p refs Sponsored jointly with Army Mobility Equipment R and D Center
(Contract N00014-66-C-0051; NR Proj. 196-049)
(AD-739735) Avail: NTIS CSCL 06/2

The state-of-the-art in bilateral manipulator type man-augmentation systems was dramatically advanced. At the inception of this program, such systems typically handled a maximum of approximately 100 lbs., were large and heavy in relation to their payloads and were generally suited only for remote operation. By contrast, the Hardiman I prototype,

consisting of thirty powered joints, can lift itself plus loads equal to its own weight of 1500 lbs. It is packaged to be worn by a man and mimic his motions, maintaining the man's dexterity and feel of the task being performed. In addition to the obvious mechanical design constraints of packaging such a system, it was necessary to achieve substantial technical breakthroughs in the design and analysis of high-load bilateral servo systems. The control technology advances achieved on this program have been instrumental in the development of new concepts in handling ordnance and general cargo for military applications.
Author (GRA)

N72-28113# School of Aerospace Medicine, Brooks AFB, Tex.
COMPARISON OF SERIAL AUDIOGRAMS AS MEASURED BY THREE THRESHOLD PROCEDURES Final Report, Feb - Oct. 1971
Roy Danford, Jr. and Vernon C. Bragg Feb. 1972 15 p refs
(AF Proj. 7755)
(AD-739896; SAM-TR-72-6) Avail: NTIS CSCL 06/2

Seven subjects with normal hearing were tested by three audiometric procedures: manual, Bekesy type, and pulse count. Six frequencies were tested for each ear on five different days. The mean thresholds measured by these technics were compared. No clinically significant differences were found between threshold measures made by any of the three procedures.
Author (GRA)

N72-28114# Human Engineering Labs., Aberdeen Proving Ground, Md.
OPERATION ON THE MOVE: A FEASIBILITY STUDY
R. Bruce McCommons Jan. 1972 30 p
(AD-738133; HEL-TM-2-72) Avail: NTIS CSCL 05/10

The investigation was conducted to determine the feasibility of having personnel operate command and control system equipment on the move. Subjects were required to do a variety of psychomotor tasks inside a truck-mounted shelter while the vehicle traversed road courses of varying severity. The report discusses how well the subjects performed the required tasks and how that performance might be enhanced. Author (GRA)

N72-28115# Texas Technological Univ., Lubbock.
PERFORMANCE OF REAL AND NOMINAL CREWS UNDER TRANSFER CONDITIONS: TWO EXPERIMENTS
Clay George and Duane Miller Mar. 1972 16 p refs Submitted for publication
(Contract DAAD05-69-C-0102; Proj. Themis)
(AD-738176) Avail: NTIS CSCL 05/10

Two experiments were reported concerning transfer facilitation and interference derived from reversal of initial task requirements. Comparisons were made between individuals and two-man crews. Results from Experiment 1 revealed that those receiving an interpolated work session performed reliably better than those receiving a rest pause. Two-man crews also performed at a faster rate than did individuals. Results from Experiment 2 confirmed the crew versus individual performance differences, with an additional finding that crews adapted more adequately to rapidly changing response requirements. Author (GRA)

N72-28116# Applied Psychological Services, Wayne, Pa. Science Center.
PREDICTION OF HUMAN RELIABILITY. PART 1: DEVELOPMENT AND TEST OF A HUMAN RELIABILITY PREDICTIVE TECHNIQUE FOR APPLICATION IN ELECTRONIC MAINTAINABILITY PREDICTION
Arthur I. Siegel and Philip J. Federman 10 Nov. 1971 102 p refs
(Contract N62269-71-C-0014)
(AD-738572; Rept-7172-2-Pt-1) Avail: NTIS CSCL 05/9

Solution to the problem of estimating the probability that a given electronic malfunction will be corrected within a given time is addressed through compatible, complementary techniques. One technique compounds Fleet derived job factor success probability data to yield a probability of malfunction correction success. The complementary technique, based on computer simulation methods, yields the anticipated time for malfunction correction. The two techniques were applied to two different operational Navy systems. The results are presented and discussed in the context of technique reliability, utility, discriminating power, and reasonableness of obtained results. GRA

N72-28117# Air Force Human Resources Lab., Williams AFB, Ariz. Flying Training Div.
AN INSTRUCTION MANUAL FOR USING PERFORMANCE RECORD SHEETS DESIGNED FOR PRIMARY PILOT TRAINING
James F. Smith and Ralph E. Flexman (Ill. Univ.) Mar. 1972 96 p ref
(AD-739190; AFHRL/FT-TR-72-11) Avail: NTIS CSCL 05/9

The report provides a description of all steps required to develop daily performance record sheets (PRS); provides examples of PRSs which were used successfully; describes instructor training necessary to insure satisfactory results; and highlights restrictions or limitation to the use of this technique.
Author (GRA)

N72-28118# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE COMPLEX ORGANIZATION OF NEW WORK IN THE AERO ENGINEERING SERVICE (AES) OF THE AIR FORCE/AIR DEFENSE
H. Jaretzki 11 Dec. 1971 13 p Transl. into ENGLISH from Militaertechnik (East Ger.), no. 1, 1970 p 32-33
(AF Proj. 1368)
(AD-739217; FTD-HT-23-853-71) Avail: NTIS CSCL 05/9

The report states the necessity for leadership in the new innovations in the aviation engineering service of the Air Force/Air Defense Service. In addition, this concept is dealt with in considerable detail and particularly in the mass production of leaders, technical procedures in servicing and maintaining aircraft operational readiness, working conditions and materials, the analytical processes and the qualification of engineering technical personnel. In conclusion, the advantages that the application of this concept presents are briefly outlined.
Author (GRA)

N72-28119# South Carolina Univ., Columbia. Coll. of Engineering.
BEHAVIOR OF MECHANICAL MODEL OF SYSTEMIC CIRCUIT OF CARDIOVASCULAR SYSTEM
W. H. Hoppmann, II Aug. 1971 27 p refs
(Contract DAAD05-70-C-0385)
(AD-738583) Avail: NTIS CSCL 06/2

A simplified physical model of the systemic circuit of the human cardiovascular system was previously designed and constructed for the purpose of studying certain mechanical aspects of fluid flow in such systems. With the model an extensive investigation of several aspects has now been made. It consists essentially of experimental studies of the effect of variation of rigidity of the tubes, of the effect of bleeding on performance, and the effect of the variation of frequency of drive on systemic behavior. A preliminary report was previously made on the first two subjects. For these, a significant addition is described in the present report. Also, important findings concerning frequency effects are given in some detail. Author (GRA)

N72-28120# Air Force Academy, Colo.
FOUR IN-DEPTH STUDIES OF A FLIGHT TRAINING SKILL: TRIAL AND ERROR VERSUS PROMPTED LEARNING EVALUATED ON EFFICIENCY, TRANSFER AND STRESS
Dirk C. Prather, Gene A. Berry, and Gerald L. Jones Dec. 1971 38 p refs
(AD-739614; USAFA-RR-71-11) Avail: NTIS CSCL 05/9

The following experiments provide an in-depth study of

prompting versus trial-and-error (T and E) learning of a perceptual skill similar to that experienced by fighter pilots, which was a simulation of strafing-range estimation. The studies were concerned with which training method will require the least number of trials to learn a given task, which will most facilitate transfer of the learned task to new stimulus situations, which will yield the best performance under stress both on the training task and on the transfer task, and can resistance to stress be learned during training. The learning curves of both groups reflect little differences between training methods in learning the skill to asymptote. T and E was the superior training method on transfer (p-.05) and under stress (p-.01). Performance curves indicated that resistance to stress can be learned in the training environment (p-.05). The results were interpreted as evidence that the trainee should be allowed to make some errors during training and develop his own intrinsic cues through trial-and-error learning. The indiscriminate use of prompting methods is open to question. Author (GRA)

N72-28121# Texas A&M Univ., College Station. Dept. of Industrial Engineering.
AN INVESTIGATION OF ALTERNATIVE METHODS OF VISUAL CUING M.S. Thesis
Michael E. Harvey 1971 28 p refs Supported by Army
(AD-739583) Avail: NTIS CSCL 05/10

An investigation of the effects of three methods of visual cuing on human performance are presented. Specifically this study attempts to determine which of the three cuing techniques, conventional, color, or spatial, when applied to a visual control panel has the greatest effect on reducing operator reaction time. The results of the study should be of primary interest in the basic design of control panels. However, the results may be of value in improving maintainability characteristics of complex systems monitored by large control panels. Statistical results as well as practical considerations indicate that conventional cuing techniques should be used for displays of limited size with no primary loading task. Finally, extensions to the present research are suggested which could add depth and thoroughness to the solution of the problem. Author (GRA)

N72-28122# Human Resources Research Organization, Alexandria, Va.
COMPARISON AND EVALUATION OF PRINTED PROGRAMS FOR AIRCRAFT RECOGNITION
Elmo E. Miller and Arthur C. Vicory Oct. 1971 37 p refs
(Contract DAHC19-70-C-0012; DA Proj. 2Q0-62107-A-712)
(AD-739521; HUMRRO-TR-71-22) Avail: NTIS CSCL 05/9

Several printed prototype programs for training visual aircraft recognition were developed and compared experimentally. One program produced an average score of 95% on a printed recognition test (the next closest group test had more than twice as many errors). The program also tended to take the least time to administer (about 15 minutes per aircraft). The training was in three phases: Study of Multi-Image Cards (each showing several views of one aircraft, listing distinctive features); Study of Paired Comparison cards (each showing two or three aircraft that are likely to be confused) ; Study of flash Cards (each showing one view of one aircraft--10 different cards for each aircraft). After each phase, tests with printed imagery were administered. The program should be feasible and effective for routine training. Author (GRA)

N72-28123# Human Resources Research Organization, Alexandria, Va.
STUDIES OF AIRCRAFT RECOGNITION TRAINING
Paul G. Whitmore, William C. Rankin, Robert D. Baldwin, and Sandra Garcia Feb. 1972 51 p
(Contract DAHC19-70-C-0012; DA Proj. 2Q0-62107-A-712)
(AD-739923; HUMRRO-TR-72-5) Avail: NTIS CSCL 05/9

The research dealt with three problem areas: selection of the minimum number of views of each aircraft required for effective recognition training, determination of an appropriate exposure duration for test images, and determination of the relative emphasis needed on friendly and hostile aircraft to produce adequate identification performance. The uniformity of performance on a posttraining test was a function of the number and distribution of the views used in training and the similarity level of the aircraft. Differences in duration from one to five seconds were critical only for the most highly similar aircraft. Both friendly and hostile aircraft need to be given equal training emphasis. Author (GRA)

N72-28956* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MINIATURE BIOTELEMETER GIVES MULTICHANNEL WIDEBAND BIOMEDICAL DATA
J. B. Carraway *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 152-166 (For availability see N72-28941 19-34)
CSCL 06B

06 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N72-28124 National Lending Library for Science and Technology, Boston Spa (England).
FORMATION OF ZINC OXIDE ON THE SURFACE OF ZINC SULPHIDE
M. Sakaguchi and T. Hirabayashi Apr. 1972 14 p refs Transl. into ENGLISH from Denki Kagaku (Japan), v. 38, no. 9, 1970 p 671-675
(NLL-RTS-6880) Avail: Natl. Lending Library, Boston Spa, Engl.: £1.30; 4 NLL photocopy coupons

The role of a firing consisting of a mixture of hydrogen sulfide and a chemical vapor in the production of zinc sulfide phosphors was clarified. A series of studies was carried out on adsorption of electronegative elements, such as sulfur and chlorine, and diffusion in the solid phase. Mixtures of oxygen and hydrogen chloride were prepared and zinc sulfide was fired into each of the mixtures. The oxidation reaction in progress at the solid-gas interface was observed. The crystalline characteristics of the zinc oxide formed were observed, and the mechanism of zinc oxide formation on the surface zinc sulfide was inferred.
Author

N72-28125 National Lending Library for Science and Technology, Boston Spa (England).
X-RAY FLUORESCENCE SPECTROMETRIC DETERMINATION OF MAGNETIC MATERIALS BY SOLUTION METHOD
N. Honma and I. Kawashima Apr. 1972 30 p refs Transl. into ENGLISH from Denki Tsushin Kenyusho Kenkyu Jitsuyoka Hokoku (Tokyo), v. 18, no. 1, 1969 p 255-265
(NLL-RTS-6784) Avail: Natl. Lending Library, Boston Spa, Engl.: £3.50 or 12 NLL photocopy coupons

Using H_3PO_4 that has the strongest dissolving power, X-ray fluorescence spectrometeric determination of various samples by solution method was established. The most difficult problem in the fluorescence spectrometric analysis is the matrix effect. Matrix effect was reduced by using a solvent, and suitable correction was made. Due to small change of total mass absorption coefficient in the solution method, an approximate linear relation exists between the total mass absorption coefficient and the X-ray intensity ratio. Relationship between the slope of the curve and the X-ray wavelength can be determined empirically, and correction term can be determined from the wavelength. Using this method, the matrix effect was cancelled entirely for the elements ranging from atomic number 56 (Ba) to number 19 (K). Author

N72-28126 National Lending Library for Science and Technology, Boston Spa (England).
THE CONTINUOUS DETERMINATION OF TRACES OF

WATER IN GASES WITH A NEW MEASURING CELL
E. Sistig 28 Feb. 1972 9 p refs Transl. into ENGLISH from Chem. Ing. Tech. (Weinheim/Bergstr., West Germany), v. 43, no. 19, Oct. 1971 p 1061-1064
(NLL-RISLEY-TR-2297-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The construction and mode of operation of a measuring instrument, with a new type of measuring cell, for determining traces of water in gases is described. It uses Karl Fischer's reagent and the dead stop method. In a special glass cell, with no moving parts, enough iodine is produced electrolytically - corresponding to the amount of water centering the reagent with the gas - to keep the reagent always dry. The current needed for this electrolysis is thus a criterion of the amount of water in the gas. Finally, experiences with this cell are described. Author

N72-28127 National Lending Library for Science and Technology, Boston Spa (England).
CORROSION OF THERMALLY HIGHLY LOADED HEATING SURFACES AT THE WATER-STEAM SIDE
H. J. Baumler 30 Mar. 1972 16 p refs Transl. into ENGLISH from Z. Ver. Deutsch. Ing. (Berlin), v. 113, no. 11, Aug. 1971 p 859-864
(NLL-CE-Trans-5827-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Corrosion experiments and tests on heating surfaces subject to high thermal loading in once-through boilers and in test rigs closely approximating operational conditions, when combined with the use of continuous hydrogen monitoring and X-ray test methods, resulted in increased knowledge of the corrosion mechanism. Hydrogen measurement proved to be an excellent means of permanently monitoring corrosion. For corrosion in evaporative tubes, two preferred ranges were found: one in the subcooling range shortly before the start of boiling and the other near the end of evaporation. Author

N72-28128 National Lending Library for Science and Technology, Boston Spa (England).
ADSORPTION OF WATER VAPOUR ON Al2O3-TiO2-H2O ADSORBENTS DEPENDING ON THEIR COMPOSITION AND HYDROTHERMAL TREATMENT
G. G. Karunnaya and M. F. Yarmolenka Mar. 1972 8 p refs Transl. into ENGLISH from Vestsi Akad. Belaruss. SSR Ser. Khim. Navuk (USSR), v. 71, no. 4, 1971 p 10-13
(NLL-RTS-7064) Avail: Natl. Lending Library, Boston Spa, Engl.: £0.70; 2 NLL photocopy coupons

The porosity of Al2O3-TiO2-H2O adsorbents was determined based on their adsorption of water vapor. The structure and adsorption properties and their relation to composition and hydrothermal treatment conditions were studied using adsorption and infrared spectroscopy. K.P.D.

N72-28129 National Lending Library for Science and Technology, Boston Spa (England).
OXIDATION OF LEAD SULPHIDE BRIQUETTES
A. V. Spasov Apr. 1972 15 p refs Transl. into ENGLISH from Godichnik Sofiiskiya Univ., Khim. Fak. (Sofia), v. 62, 1967/1968 p 157-169
(NLL-RTS-6996) Avail: Natl. Lending Library, Boston Spa, Engl.: £1.40 or 5 NLL photocopy coupons

The oxidation of PbS in the form of briquettes in a stream of air was investigated using a thermal balance; the gaseous products of oxidation were then trapped. X-ray structural analysis was employed to determine the change in phase constitution in the oxidized layer with change in temperature. The activation energy of oxidation was calculated and the composition of a new phase of PbO(PbSO4) was established. K.P.D.

N72-28130*# Miami Univ., Coral Gables, Fla. Inst. of Molecular Evolution.
THE RAPID EVOLUTION OF COMPLEX SYSTEMS FROM SIMPLE BEGINNINGS
Sidney W. Fox 1971 18 p refs Presented at the 3d Intern. Conf. on Phys. Theory in Biol. (Inst. de la Vie), Versailles, France, 22 Jun. 1971
(Grant NGR-10-007-008)
(NASA-CR-127466; Contrib-194) Avail: NTIS HC $3.00 CSCL 07C

Methods for the geological production of proteinous amino acids are examined. Particular attention was given to organic evolution and thermal polymerization. Also included are data on amino acid reactions after polymerization. E.H.W.

N72-28131*# Scientific Translation Service, Santa Barbara, Calif.
DISSOLVING ORES AND REFRACTORIES BY SODIUM PEROXIDE FUSION IN A VITREOUS GRAPHITE CRUCIBLE
G. Jecko and R. Royer Washington NASA Jun. 1972 8 p refs Transl. into ENGLISH from Chim. Anal. (Paris), v. 52, no. 10, 1970 p 1109-1111
(Contract NASw-2035)
(NASA-TT-F-14303) Avail: NTIS HC $3.00 CSCL 07D

For the analysis of chromites or refractories, vitreous graphite crucibles 50 mm high, outer diameter 50 mm, inner diameter 45 mm are preferable to Fe, Ni, or Pt crucibles. Fusion with Na2O2 is more complete, especially for Fe ores. After washing with H2O and oven drying, the graphite crucible can be reused 10 to 15 times. For 3 std. samples recoveries of Fe, Si, Al, and Ti were essentially quantitative. Author

N72-28132# Metaalinstituut TNO, Delft (Netherlands).
EXAMINATION OF CORRODED RUDDER HUB DOKKUM CLASS [ONDERZOEK GESCHEURDE ROERKONING DOKKUM-KLASSE]
T. P. R. Regenboog 8 Feb. 1972 13 p In DUTCH
(M72/07/18-REG/HT) Avail: NTIS HC $3.00

Microstructural analysis on a piece of rudder hub flange showed that corrosion developed during the forging process. It is believed that deterioriation followed a combination of overheating and too much deformation. Corrosion of flange surfaces from two used rudder hubs was attributed to poorly adhesive paint.
Transl. by G.G.

N72-28133*# National Aeronautics and Space Administration, Washington, D.C.
THE STABILITY OF ESTER TYPE PLASTICIZERS. 2: THE INFLUENCE OF INORGANIC FILLERS AND PIGMENTS ON THE VOLATILITY OF PHTHALIC ACID PLASTICIZERS
Zoltan Wolkober Feb. 1972 20 p refs Transl. into ENGLISH from Mag. Kem. Lapja (Budapest), v. 23, no. 8, 1968 p 433-439
(NASA-TT-F-14404) Avail: NTIS HC $3.00 CSCL 07D

The volatility of plasticizers is the result of physical transport processes and decomposition processes induced by oxidation. The volatility loss in PVC-plasticizer mixtures is significantly higher than that of the plasticizers alone. Pigments and fillers increase considerably the volatility of plasticizers. The bisphenol A as antioxidant decreases the volatility loss of the PVC-plasticizer system. Irradiation with a xenon lamp causes also a measurable volatility loss even at room-temperature, and this loss is especially high in the presence of anatase titanium dioxide. Author

N72-28134*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CADMIUM POISONING OF OXYGEN REDUCTION ON PLATINUM ELECTRODE IN POTASSIUM HYDROXIDE
Riley O. Miller Washington Jul. 1972 17 p refs
(NASA-TM-X-2604; E-6818) Avail: NTIS HC $3.00 CSCL 07D

Experiment with a rotating disk and ring apparatus showed no poisoning by cadmium in 8.5 M KOH, alone or with Cl(-) or CO3(=). Poisoning does not occur either in 0.1 M KOH supernatant at CdO, but a partially reversible poisoning results

from .0001 M CdCl2 and traces of fatty acid are present. Evidence indicates that the catastrophic poisoning affects the four-electron O2 reduction more than it does the one-electron H3O(+) discharge. Author

N72-28135*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESONANCE SPECTRA OF A PARAMAGNETIC PROBE DISSOLVED IN A VISCOUS MEDIUM
Jerome I. Kaplan (Battelle Mem. Inst., Columbus, Ohio), Edward Gelerinter (Kent State Univ., Ohio), and George C. Fryburg 1972 7 p refs Presented at 4th Intern Liquid Crystal Conf., Kent, Ohio, 20-25 Aug. 1972
(NASA-TM-X-68111; E-7049) Avail: NTIS HC $3.00 CSCL 07D

A model is presented for calculating the paramagnetic resonance (EPR) spectrum of vanadyl acetylacetonate (VAAC) dissolved in either a liquid crystal or isotropic solvent. It employs density matrix formulation in the rotating reference frame. The molecules occupy several discrete angles with respect to the magnetic field and can relax to neighboring positions in a characteristic time tau(theta). The form of tau(theta) is found from a diffusion approach, and the magnitude of tau(theta) is a measure of how freely the VAAC probe tumbles in the solvent. Spectra are predicted for values of tau between 10 to the minus 11th power sec and 10 to the minus 7th power sec. The EPR spectrum, in the isotropic case, is obtained be summing the contributions from the allowed angles weighted by the polar volume element, sin theta. When applying the model to the nematic liquid crystal case it is also necessary to multiply by the Saupe distribution function. For this case tau(theta) is obtained from the diffusion approach in which two diffusion constants are employed to reflect the difference in the parallel and perpendicular components of the viscosity. Author

N72-28136*# Scientific Translation Service, Santa Barbara, Calif.
SPECTROCHEMICAL DETERMINATION OF ULTRATRACE ELEMENTS BY THE ARGON ARC METHOD
H. Kawaguchi, N. Higematsu, and A. Mizuike Washington NASA Jul. 1972 13 p refs Transl. into ENGLISH from Jap. Anal. (Japan), v. 19, 1970 p 1543-1548
(Contract NASw-2035)
(NASA-TT-F-14506) Avail: NTIS HC $3.00 CSCL 07D

Short-lasting, high current argon arc excitation (30 A, 0.7 sec) was applied to the analysis of nanogram amounts of elements deposited on the end of a graphite electrode. A simple tube-chamber was used to control the atmosphere. Strong enchancement of the line intensities and reduction of matrix effects were found when small amounts (20 ug) of alkali elements were added, but their effects on the arc temperature and electron density were not significant. The investigation using radioactive tracer Cu-64 indicated that the alkali elements raised the evaporation rate of the elements deposited on the electrode which accounted for the enhancement of line intensities. The sensitivity of the method was much higher than that of the copper spark method and comparable to that of the impulse argon arc method. Author

N72-28137*# Translation Consultants, Ltd., Arlington, Va.
THE ABIOGENETIC FORMATION OF PORPHIN, CHLORIN, AND BACTERIOCHLORIN
A. A. Krasnovskiy and A. V. Umrikhina Washington NASA Jul. 1972 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 202, no. 1, 1972 p 221-224
(Contract NASw-2038)
(NASA-TT-F-14355) Avail: NTIS HC $3.00 CSCL 07D

The use of model systems simulating prebiological conditions on earth to study the problem of the abiogenetic formation of porphyrins during the chemical evolution process is discussed. Author

N72-28138*# Scientific Translation Service, Santa Barbara, Calif.
BIOLOGICAL REDUCTION OF MINERAL PHOSPHATES
K. I. Rudakov Washington NASA Jul. 1972 22 p Transl. into ENGLISH from Zentr. Bakteriol., v. 70, no. 2, 1927 p 202-214
(Contract NASw-2035)
(NASA-TT-F-14411) Avail: NTIS HC $3.25 CSCL 07C

An attempt was made to determine the cause and amount of biological P2O5 reduction in the soil. A culture medium of tap water, mannite, and NH4H2PO4 was made, injected with different soils, and studied under anaerobic conditions. Experimental results show that biological absorption and soil microorganisms are responsible for the drastic reduction of P2O5 as well as the type of soil the mineral is present in. Results also show that additions of sulfuric and nitric acid can control phosphoric reductions. Move detailed results are given in tabular form. E.H.W.

N72-28139# National Research Council of Canada, Ottawa (Ontario).
THE ELECTROCHEMICAL POTENTIAL SERIES OF THE SULPHIDES
W. Noddack, K. Wrabetz, and W. Herbst 1972 14 p refs Transl. into ENGLISH from Z. Elektrochem. (Weinheim), v. 59, no. 718, 1955 p 752-755
(NRC-TT-1567) Avail: NTIS HC $3.00

An interpretation is presented of the results of no-current potential measurements made on galvanic cells with sulfide electrodes. A practical potential series of the electrically conducting sulfides was constructed. A number of associated phenomena (effect of atmospheric oxygen, electromotive effects, etc.), observed in the course of the measurements, is discussed along with some ideas concerning the electrochemical processes involved. Author

N72-28140# National Research Council of Canada, Ottawa (Ontario).
THE ELECTROCHEMICAL BEHAVIOUR OF SOME HEAVY METAL SULPHIDES
W. Noddack and K. Wrabetz 1972 19 p refs Transl. into ENGLISH from Z. Elektrochem. (Weinheim/Bergstr.), v. 59, no. 2, 1955 p 96-102
(NRC-TT-1566) Avail: NTIS HC $3.00

The causes of the so-called natural terrestrial electric currents are divided into two main groups: (1) physical causes: variations in the terrestrial magnetism, atmospheric electrical phenomena, aurora borealis and electrical radiation from the sun, and (2) electrochemical causes: potential differences between ore bodies of different chemical structure, especially sulfides and oxides of the heavy metals, which when interspersed with electrolytic solutions can result in galvanic chains. Measurements were made on galvanic cells with sulfide electrodes, with no current flowing. A few general concepts concerning the processes taking place at the electrodes were derived from the test results. Author

N72-28141# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
TRACE GAS ANALYSIS BY MOBILITY SEPARATION
George Peter Laszlo Dec. 1971 29 p refs
(UTIAS-TN-166) Avail: NTIS HC $3.50

Alpha and beta particles or ion pairs are formed by placing a radioactive source in a sample air stream. Pulses of ions so formed can be drifted down a tube by a one-dimensional field, and a time-of-arrival spectrum is generated. This is a plasma chromatogram. Author

N72-28142# Technische Hochschule Hannover (West Germany).
CONCENTRATION AND DENSITY MEASUREMENTS ON LIQUID-LIQUID AND LIQUID-SOLID MIXTURES Ph.D. Thesis [KONZENTRATIONS UND DICHTEMESSUNGEN AN FLUESSIG-FEST UND FLUESSIG-FLUESSIG GE-

MISCHEN]
Joerg Neumann 1971 91 p refs In GERMAN
Avail: NTIS HC $6.75

A magnetic scale is reported for measuring ferromagnetic liquid-solid suspensions that registers continuously ferromagnetic solids content in a fluid flow by movable magnet. Example measurements performed on magnetite and ferrous silicon established the linear dependency of the obtained value on density distribution; increased magnetite grain size reduced measurement potential parrallel to density decrease. Dynamic oscillator measurements on liquid-solid suspensions for concentration densities proved sensitive and accurete at certain temperature regimes; density measurements on liquid-liquid mixtures by oscillator showed an accuracy factor of plus or minus 0.000001. Transl. by G.G.

N72-28143*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
BIBLIOGRAPHY OF PHOTOABSORPTION CROSS-SECTION DATA
Robert D. Hudson and Lee J. Kieffer (Colo. Univ.) Boulder, Colo. Colo. Univ. 30 Sep. 1970 48 p refs
(NASA-TM-X-68668; JILA-11) Avail: NTIS HC $4.50 CSCL 07D

This bibliography contains only references which report a measured or calculated photoabsorption cross section (relative or normalized) in regions of continuous absorption. The bibliography is current as of January 1, 1970. Author

N72-28144# Joint Publications Research Service, Arlington, Va.
EMISSION PROPERTIES OF MATERIALS
V. S. Fomenko 24 Jul. 1972 177 p refs Transl. into ENGLISH of the book "Emissionnyye Svoystva Materialov" Kiev, Naukova Dumka Publishing House, 2 Nov. 1970 146 p
(JPRS-56579) Avail: NTIS HC $11.00

Electron emission parameters (work function of electrons and the Richardson constant) are presented for the chemical elements and their compounds, and also for films applied on various substrates. Author

N72-28145*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN ETIOLOGICAL STUDY OF PHTHALATE SELF-CONTAMINATION OF SPACECRAFT AND CONTAMINATION FROM THEIR EARTHLY ENVIRONS
Frederick C. Gross and Joe A. Colony Washington Aug. 1972 19 p refs
(NASA-TN-D-6903; G-1070) Avail: NTIS HC $3.00 CSCL 07D

Phthalates are very objectionable contaminants in space experiments because of their strong absorption in the UV and IR regions of the spectrum. Thus, even minute amounts of these compounds migrating to optical equipment, in test or space flight conditions, can seriously compromise the results of experiments by altering the sensitivity of the functional equipment. Volatility data of the phthalates and other plasticizers are presented in addition to UV spectra of ultrathin films of these same types of compounds. Sources of plasticizer contamination are revealed with special recognition given to di-2-ethylhexyl phthalate (DEHP), the single most ubiquitous plasticizer in use. A surprisingly large percentage of the outgassing condensates from vacuum testing of spacecraft contain DEHP as well as other plasticizers. IR and gas chromatography/mass spectroscopy methods were used to analyze samples from spacecraft. Methods for successful reduction of plasticizers and other contaminants are mentioned. Author

N72-28146# California Univ., Livermore. Lawrence Livermore Lab.
STATISTICAL MECHANICS OF REACTING GASES WITH APPLICATIONS TO THE EQUATION OF STATE OF HYDROGEN Ph.D. Thesis
Forrest J. Rogers 7 Feb. 1972 104 p refs
(Contract W-7405-eng-48)
(UCRL-51158) Avail: NTIS

A method was developed from fundamental statistical mechanics for systematically correcting the ideal gas equation of state (Saha equation) to take into account the interactions that occur in any real gas. At the current stage, all effective two-body interactions that can occur among the various species present in the system are taken into account. Because of the long-range nature of the Coulomb potential, the problem is formulated from the point of view of many-body perturbation theory. It is necessary to use the quantum theory to avoid the short-range divergence of the classical cluster integrals. However, considerable insight into the form of the quantum-mechanical result is obtained from the classical perturbation theory. The result of the many-body perturbation theory is that the Coulomb problem is replaced with a problem involving the cluster coefficients of the screened Coulomb potential and a large number of other terms associated with plasma interactions. Author (NSA)

N72-28147# Louisiana State Univ., Baton Rouge. Dept. of Electrical Engineering.
PRACTICAL APPLICATIONS OF ADVANCED CONTROL THEORY Ph.D. Thesis
William Harold Pusch, Jr. Dec. 1971 224 p refs
(Contract F44620-68-C-0021; AF Proj. 9749)
(AD-739579; AFOSR-72-0708TR) Avail: NTIS CSCL 12/1

The document is written in an effort to illustrate some of the problems involved in the design of control systems for chemical processes and to present approaches that can be taken to overcome these problems. Adaptive control, nonlinear control, optimal control, direct digital control, and multivariable control are discussed with the emphasis on applying them to typical chemical processes. Author (GRA)

N72-28148# California Univ., Los Angeles. School of Engineering and Applied Science.
FLOW CHANNEL CELL APPARATUS FOR HIGH RATE ELECTROLYSIS STUDIES
Dieter Landolt Jan. 1972 22 p refs
(Contract N00014-69-A-0200; NR Proj. 036-088)
(AD-739719; UCLA-ENG-7207; TR-2) Avail: NTIS CSCL 07/4

A simple flow channel cell apparatus is described which is suited for high rate electrolysis studies under well controlled hydrodynamic conditions. This design includes a discontinuously operated piston pump which presses the electrolyte through the electrochemical cell at linear velocities of up to 2000 cm/sec. An electrolyte volume of less than 2 liters is required for the operation of the apparatus. No metal parts except for the electrodes are in contact with the solution. Mass transfer characteristics of the flow channel cell have been determined by measuring limiting currents for the reduction of ferricyanid. Author (GRA)

N72-28149# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
BEHAVIOR OF BERYLLIUM SULFATE IN HARD AND SOFT WATER Final Report, 1970 - 1971
Arnold R. Slonim Dec. 1971 27 p refs
(AF Proj. 6302)
(AD-739888; AMRL-TR-71-100) Avail: NTIS CSCL 07/4

The interaction of beryllium with hard and soft water represents the first phase of a study of beryllium effects on water and fish. The pH of BeSO4 in soft water is significantly lower than in hard water over the concentration range from 0.01 to 100 mg/l Be(2-). An insoluble complex forms only in hard water within a limited beryllium concentration range. Water hardness per se is a significant determinant of the pH of beryllium solutions. The amount of NaHCO3 needed to buffer varying amounts of concentrated (acidic) beryllium solutions is compared on a molar basis between soft and hard water. Beryllium has no effect on the hardness or dissolved oxygen content of either test water, but shows greater changes in conductivity of soft water than hard water. Author (GRA)

N72-28150# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
NMR SPECTRAL CHROMATOGRAPHY: A POWERFUL NEW TOOL FOR STRUCTURE DETERMINATION
Roger E. Rondeau and Martin A. Berwick Jan. 1972 136 p refs
(AF Proj. 7360)
(AD-739885; AFML-TR-71-282) Avail: NTIS CSCL 07/4

A new technique is described which radically simplified complex nuclear magnetic resonance spectra and markedly increases their information content. Through the use of a unique chemical additive in a sample solution, overlapping spectral peaks are separated, coincidental resonances are dispersed and the entire spectrum remarkably simplified as a result of induced spectral shifts. The additive is a fluorinated rare earth chelate, Eu(fod)3, which is believed to represent the optimum combination of lanthanide metal and organic ligand for use as a shift reagent. Its effect on an NMR spectrum is to chromatograph it by causing spectral absorptions to move to different extents along the spectral chromatogram. The value of NMR Spectral Chromatography is demonstrated by the analysis of a number of complex, misleading and, in some cases, unresolvable spectra. Useful relationships between molecular structure and shifting patterns are pointed out and used in making structural assignments. Author (GRA)

N72-28151# Kentucky Univ., Lexington. Water Resource Inst.
DETECTION AND IDENTIFICATION OF MOLECULAR WATER POLLUTANTS BY LASER RAMAN SPECTROSCOPY
Final Report, Sep. 1968 - Aug. 1971
Eugene B. Bradley, Charles A. Frenzel, John Reeves, Robert McConnell, and Kay Lane Oct. 1971 48 p refs
(Contract DI-14-31-0001-3217)
(PB-208029; RR-44) Avail: NTIS HC $3.00 CSCL 07D

Laser Raman spectroscopy is evolving into a primary tool for the identification of molecular water pollutants. The study approaches the limits of detectivity of carbon disulfide and benzene to about 20 ppm in water solutions using a high-resolution Raman spectrometer, cooled detectors, and photon counting techniques. An optomized design for a pollution measuring instrument is suggested, and a prototype has been built which is useful with any value of excitation energy short of sample degrading. The present instrument scans spectrum windows with fixed preselecting filters followed by a small single monochromator with high throughput. The resulting detectivity with 20 mw of laser power was only 1000 ppm. Author (GRA)

N72-28152# Army Missile Command, Redstone Arsenal, Ala.
THE ELECTRONIC ABSORPTION SPECTRUM OF 3,3-BROMOETHYL-dSUB3-DIAZIRINE
L.C. Robertson and J. A. Merritt 16 Nov. 1971 16 p refs
(DA Proj. 1T0-61102-B-23-A)
(AD-739912; RR-TR-71-15) Avail: NTIS CSCL 07/4

The high resolution electronic absorption spectrum of 3,3-bromomethyl-d3-diazirine is presented. A vibrational analysis is given for the allowed singlet-singlet pi* from n system with its 0-0 band at 28 280/cm. Fundamental frequencies are compared with those of the normal molecule. The symmetrical N=N stretching vibration is the most prominent feature observed. Evidence is also presented for another electronic system 68/cm to the red of the singlet-singlet system. Author (GRA)

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N72-28153 British Broadcasting Corp., Kingswood (England). Research Dept.
L.F. AND M. F. PROPAGATION: A STUDY OF IONOSPHERIC CROSS MODULATION MEASUREMENTS
P. Knight 1972 14 p refs
(BBC-1972/23) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Measurements of ionospheric cross modulation found in the literature have been standardized to a common disturbing transmitter power and subsequently compared. It is shown that disturbing transmitters radiating in the medium frequency broadcasting band can cause as much cross modulation as those operating in the low frequency band, because of the influence of the earth's magnetic field. A semi-empirical formula for the maximum cross modulation which is likely to be observed is proposed. Author

N72-28154 British Broadcasting Corp., Kingswood (England). Engineering Div.
REDUCING NON-LINEAR EFFECTS IN KLYSTRONS FOR TELEVISION BROADCASTING
A. G. Lyner Jun. 1972 12 p refs
(BBC-1972/20) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Klystron operation is discussed, and a transfer characteristic is derived. The effects of the nonlinearity on a combined television, sound and vision signal are discussed. A circuit design is suggested for narrow band precorrection of the input signal to the klystron for elimination of the effects of its nonlinear behavior on a television signal. Author

N72-28155 British Broadcasting Corp., Kingswood (England). Engineering Div.
MF PROPAGATION: THE REDUCTION OF INTERFERENCE BY THE USE OF HORIZONTAL-DIPOLE TRANSMITTING AERIALS
P. Knight Jun. 1972 7 p refs
(BBC-1972/21) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Horizontal aerials are sometimes used for sky-wave broadcasting at medium frequencies. Interference is reduced as a result. Curves which enable field strengths, resulting from the use of horizontal aerials above ground of various conductivities, to be estimated from propagation curves are reported. Author

N72-28156# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
BEARING INSTRUMENT BY STATIC ANTENNAS. APPLICATION TO MARITIME COLLISION AVOIDANCE
Guy Ringenbach 1972 6 p ref Presented at IEE Conf. on Maritime Navigation Aids, London, 25-27 Jul. 1972
(ONERA-TP-1061) Avail: NTIS HC $3.00

The application of the phase properties of a fixed antenna for measuring directions and bearings is discussed. The turnstile antenna which consists of two half-wave, horizontal dipoles at right angles is described. Numerical analyses of the multiple paths and the antenna radiation patterns are provided. It is concluded that this procedure can be used for a maritime collision avoidance system. Author

N72-28157# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
REVIEW OF CASSEGRAIN ANTENNAS BASED ON LITERATURE STUDIES
P. Sliwinski 1972 40 p refs In GERMAN; ENGLISH summary
(DLR-Mitt-72-11) Avail: NTIS HC $4.00; DFVLR Porz-Wahn: 13,10 DM

Briefly summarized are the results from articles concerning Cassegrain antennas, appearing in numerous publications. Detailed description of individual problems and the derivation of

mathematical expressions have been omitted. With the aid of the standard Cassegrain antenna the geometry and properties (aperture function, gain etc.) are discussed. The various types of Cassegrain antennas together with their advantages and disadvantages are described. The report concludes with a brief treatment of feeds, taking into account the recent developments in the field of hybrid mode excitation. Author

N72-28158*# Ohio State Univ., Columbus. Dept. of Electrical Engineering.
A THEORETICAL STUDY OF RADAR RETURN AND RADIOMETRIC EMISSION FROM THE SEA
William H. Peake Washington NASA Jul. 1972 11 p refs
(Contract NAS1-9998)
(NASA-CR-2092; Rept-3030-2) Avail: NTIS HC $3.00 CSCL 17I

The applicability of the various electromagnetic models of scattering from the ocean are reviewed. These models include the small perturbation method, the geometric optics solution, the composite model, and the exact integral equation solution. The restrictions on the electromagnetic models are discussed. Author

N72-28159*# Ohio State Univ., Columbus. ElectroScience Lab.
THE PREDICTION OF MILLIMETER WAVELENGTH PRECIPITATION ATTENUATION USING A CYLINDRICAL STORM CELL MODEL
L. R. Zintsmaster and D. B. Hodge Jun. 1972 78 p refs
(Grant NGR-36-008-080)
(NASA-CR-122445; TR-2374-10) Avail: NTIS HC $6.00 CSCL 20N

The single terminal and two terminal diversity precipitation attenuation distributions are calculated for a millimeter wavelength earth-satellite propagation path. The calculated probability distributions are compared to attenuation probability distributions measured at two locations with the ATS-5 millimeter wavelength experimental 15.63 GHz downlink. Using an empirically derived three mode exponential cell diameter-rain rate function, the calculated distributions agreed within -2 to +1 db of the measured distributions for both terminal locations. The sensitivity of the calculated distribution to variations of the cell model parameters was also investigated. Author

N72-28160*# Virginia Polytechnic Inst., Blacksburg.
POLARIZATION EFFECTS IN MILLIMETER WAVE PROPAGATION THROUGH RAIN: A REVIEW OF PRESENT THEORY AND A DISCUSSION OF CURRENT EXPERIMENTS
P. H. Wiley, C. W. Bostian, W. L. Stutzman, and R. E. Marshall 19 Apr. 1972 21 p refs
(Grant NGR-47-004-091)
(NASA-CR-122503) Avail: NTIS HC $3.25 CSCL 20N

An attempt was made to calculate the depolarization effects of rain on linearly or elliptically polarized millimeter waves. Results are given in graphs and tables. E.H.W.

N72-28161# Institute for Telecommunication Sciences, Boulder, Colo.
A METEOROLOGICAL MODEL FOR USE IN THE STUDY OF RAINFALL EFFECTS ON ATMOSPHERIC RADIO TELECOMMUNICATIONS
E. J. Dutton Dec. 1971 21 p refs
(OT/TRER-24) Avail: SOD $0.30

Drop size distribution parameters at the earth's surface were studied. Methods of ascertaining the drop size distribution in the cloud itself are presented, using an approach for analysis of data (radiosonde) taken during a known rainstorm and then using only surface data. Author

N72-28162# Joint Publications Research Service, Arlington, Va.
SOME ASPECTS OF DEVELOPMENT OF SPACE COMMUNICATIONS DURING THE NINTH FIVE-YEAR PLAN
P. S. Kurakov and I. Ya. Petrov 13 Jul. 1972 12 p Transl. into ENGLISH from Radiotekhn. (Moscow), v. 27, no. 5, May 1972 p 3-8
(JPRS-56486) Avail: NTIS HC $3.00

Developments in space communications are examined. Reference is made to the Intersputnik open international organization currently composed of nine socialist countries. Author

N72-28163# Joint Publications Research Service, Arlington, Va.
THE USE OF A COMPOUND SIGNAL ON VHF TROPOSPHERIC SCATTERING LINES
G. M. Vayzburg and A. S. Nemirovskiy 14 Jul. 1972 14 p refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 3, 1972 p 40-47
(JPRS-56506) Avail: NTIS HC $3.00

Bessel coefficients and a Laguerre series were used to investigate the feasibility of modulating a compound signal by a complex function. It was found that the use of a sine tone is adequate to obtain the modulation at an optimum modulation index. It was determined that the use of a compound signal is an effective method of controlling the fading in long range tropospheric propagation of VHF signals on multi-beam lines. Although the average value of the S/N deteriorates by 3 decibels, the simplicity of the device used compensates for this. Author

N72-28164*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
METHOD AND APPARATUS FOR SYNCHRONIZING A SINGLE CHANNEL DIGITAL COMMUNICATIONS SYSTEM
Patent Application
Lucien A. Couvillon, Jr., Christopher Carl, Richard M. Goldstein, Edward C. Posner, and Richard R. Green, inventors (to NASA) Filed 27 Jun. 1972 70 p
(Contract NAS7-100)
(NASA-Case-NPO-11302-2; US-Patent-Appl-SN-266822) Avail: NTIS HC $5.50 CSCL 17B

A method and apparatus for synchronizing a received PCM communications signal without requiring a separate synchronizing channel is reported. The technique provides digital correlation of the received signal with a reference signal, first with its unmodulated subcarrier and then with a bit sync (PN) code modulated subcarrier, where the code sequence length is equal in duration to each data bit. NASA

N72-28165*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
PULSE CODE MODULATED SIGNAL SYNCHRONIZER
Patent Application
Herbert S. Kobayshi, inventor (to NASA) Filed 24 Jul. 1972 27 p
(NASA-Case-MSC-12462-1; US-Patent-Appl-SN-274360) Avail: NTIS HC $3.50 CSCL 17B

A bit synchronizer is described for a split phase PCM transmission, including three loop circuits which receive incoming phase coded PCM signals. In the first loop, called a Q-loop, a generated, phase coded, PCM signal is multiplied with the incoming signals, and the frequency and phase of the generated signal are nulled to that of the incoming signal. In the second loop, called a B-loop, a circuit multiplies a generated carrier signal with incoming signals to null the phase of the generated signal in a phase locked relationship to the incoming signal. In a third loop, called the I-loop, a phase coded PCM signal is multiplied with the incoming signals for decoding the bit information from the PCM signal. NASA

N72-28166*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
GATED COMPRESSOR, DISTORTIONLESS SIGNAL LIMITER Patent Application
Raymond C. Woodbury, inventor (to NASA) Filed 28 Jun. 1972 23 p
(Contract NAS7-100)
(NASA-Case-NPO-11820-1; US-Patent-Appl-SN-266912) *Avail: NTIS HC $3.25 CSCL 17B

A distortionless gated compressor for limiting the amplitude of a signal so as not to produce undesired signal levels responsive thereto is disclosed. The gated compressor includes a distortionless multiplier which multiplies an AC signal from a factor defined by a DC control signal. The compressor includes a plurality of channels each responsive to a signal produced in response to the multiplier's output. As long as the signal, supplied to any channel, does not exceed a selected level for the particular signal, the output of a multi-input OR gate is constant.
NASA

N72-28167# Aeronautical Research Labs., Melbourne (Australia).
A SUB-CARRIER OSCILLATOR FOR A MINIATURE TELEMETRY SYSTEM
M. D. Card Jan. 1972 19 p refs
(ARL/FL-Note-48) Avail: NTIS HC $3.00

The development and investigation of two versions of a simple sub-carrier oscillator have been carried out. The oscillator is intended for use in a miniature telemetry system using a strain gauge as the signal source. One of the versions uses a commercial integrated circuit and is suitable for quantity production.
Author

N72-28168# Aeronautical Research Labs., Melbourne (Australia).
THE RECORDING AND REPRODUCING OF VOICE AND A SPEED CONTROL SIGNAL USING A SINGLE MAGNETIC TAPE TRACK
M. D. Card Jan. 1972 21 p refs
(ARL/FI-Note-47) Avail: NTIS HC $3.25

The number of recording channels simultaneously available on standard analogue instrumentation tape recorders is limited to seven if half-inch wide tape is used. Described is a system which enables both a capstan speed control signal and a voice annotation signal to be recorded simultaneously on a single tape track, therby maximizing the number of tracks remaining for data acquisition.
Author

N72-28169# Technische Hochschule Hannover (West Germany). Fakultaet fuer Maschinenwesen.
ANALYSIS OF THE MAGNETIC TAPE RECORDING PROCESS WITH HIGH FREQUENCY PREMAGNETIZATION USING THE PREISACH MODEL Ph.D. Thesis [EIN BEITRAG ZUR ANALYSE DES MAGNETBAND-AUFZEICHNUNGSVORGANGS MIT HOCHFREQUENZVOR-MAGNETISIERUNG UNTER VERWENDUNG DES PREISAC-H-MODELLS]
Bodo Morgenstern 1971 137 p refs In GERMAN
Avail: NTIS HC $9.00

A quantitative analysis of the magnetic recording process with alternating field premagnetization is presented that utilizes a three dimensional scheme of ferromagnetic single-span particles with individual rectangular hysteresis loops as distribution mounts. Also described is a cross split recording sound head for exclusive longitudinal registration. It is shown that enlargement of bead gap measurements by a factor of 200 allows for minimization of band layer thickness effect and reduction of signal and premagnetization frequencies so that recording losses are negligible.
Transl. by G.G.

N72-28170# Technische Hochschule Hannover (West Germany). Fakultaet fuer Maschinenwesen.
THE MAGNETIZATION DISTRIBUTION IN MAGNETIC TAPE AND ITS CONNECTION WITH OPTIMAL USE OF THE TAPE FOR MAXIMUM READING SIGNALS Ph.D. Thesis [DIE MAGNETISIERUNGSVERTEILUNG IM MAGNETBAND UND IHR ZUSAMMENHANG MIT DER OPTIMALEN AUSNUTZUNG DES BANDES FUER MAXIMALE LESESIGNALE]
Juergen Hersener 1971 119 p refs In GERMAN
Avail: NTIS HC $8.00

The theory of magnetic tape recording and research projects to determine the nature of magnetization distribution on magnetic tapes are discussed. Various methods for optimizing the response of magnetic tapes during recording are examined. Mathematical models are included to analyze the quantitative aspects of magnetic tape recording. The magnetic and electrical fields involved in magnetic tape operations are illustrated by line drawings and graphs.
Transl. by P.N.F.

N72-28171# Pennsylvania State Univ., University Park.
ATC COMMUNICATIONS: THE REAL BOTTLENECK
Matthew Rosenshine FAA Apr. 1971 11 p refs Prepared for distribution at FAA's 1971 Planning Rev. Conf.
Avail: NTIS HC $3.00

Mathematical models, utilizing Markov and queueing processes, are developed for controlling aircraft in a terminal area control sector. The models cover the effects of communications constraints on controls, number of aircraft involved in control area, and controller's ability to control all aircraft in his sector. The effects of continuous voice communication and methods for modifying the system in busy air terminal areas are discussed.
E.H.W.

N72-28172*# Geotronics, Inc., Falls Church, Va.
MATCHED PAIR CONICAL SPIRAL ANTENNAS Final Report
Robert E. Metzler Apr. 1972 54 p ref
(Contract NAS5-23053)
(NASA-CR-122511) Avail: NTIS HC $4.75 CSCL 17B

A matched pair of VHF (220-260 MHz) conical spiral antennas for use in a rocket-tracking interferometer array was designed and tested. While gain, bandwidth, impedance, and pattern measurements met specifications, the phase match between antennas at low elevations was not equal to the design goal.
Author

N72-28173*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SMALL-ANGLE STABILITY ANALYSIS OF A LINEAR CONTROL SYSTEM FOR A HIGH POWER COMMUNICATION SATELLITE
Thomas A. OMalley Washington Aug. 1972 60 p refs
(NASA-TM-X-2597; E-6865) Avail: NTIS HC $3.00 CSCL 17B

A small angle stability analysis is presented for one particular configuration of a high power communication satellite having a linear control system. Both the central body and the solar array are treated as rigid bodies. The control system studied consists of three-axis control of the central body and one-axis control of the solar array rotation relative to the central body. The results yield preliminary indications of the relation of stability to satellite inertias and control gains.
Author

N72-28174# Lockheed Missiles and Space Co., Palo Alto, Calif.
INTERFERENCE-IMMUNITY OF RADAR STATIONS
V. V. Grigorin-Riabov 1972 27 p refs Transl. into ENGLISH from the book "Radiolokatsionnye Ustroistva, Teoriia i Printsipy Postroeniia" Moscow, Sovetskoe Radio Press, 1970 p 485-520
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Radar station interference is discussed in terms of spoiling the operational capability of target detection/tracking. Interference-immunity criteria, and the effects of active interference on receiving-display, and methods for combatting interference

are presented. Automatic frequency retuning is considered to be an effective method for combatting active interference. F.O.S.

N72-28175# Royal Aircraft Establishment, Farnborough (England).
DAMIEN 3 PCM RECORDING SYSTEM AND PROGRAMMING FOR FLIGHT TESTS
Jun. 1972 32 p Transl. into ENGLISH from SFIM (France), Jul. 1971, Oct. 1971
(RAE-Lib-Trans-1638; BR-29648) Avail: NTIS HC $3.75

The use of DAMIEN 3, a numerical recording unit, in flight tests is discussed. The system is composed of a PCM commutator. Particular attention is given to those features of the unit that relate to the ARINC 573 (flight data acquisition unit). System control, program box, and test equipment are also examined. E.H.W.

N72-28176# International Telecommunication Union, Geneva (Switzerland).
TELECOMMUNICATION AND THE PEACEFUL USES OF OUTER SPACE
1972 126 p
(Rept-11) Avail: NTIS HC $8.50

The activities of the International Telecommunication Union toward the application of telecommunication for peaceful uses in outer space are reported. The subjects discussed are: (1) decisions of the World Administrative Radio Conference for Space Telecommunications, (2) telecommunication studies and standardization, (3) application of international regulations, (4) planning of international telecommunication network, and (5) cooperation with other international organizations concerned with space. The telecommunication developments in many nations are reported. Author

N72-28177# Federal Aviation Administration, Washington, D.C. Communications Branch.
TEST AND EVALUATION OF ARTCC AIR/GROUND CHANNELS AT LONG RANGE RADAR SITES
James Coyle Jan. 1972 12 p
Avail: NTIS HC $3.00

Techniques for collocating VHF and UHF communication transceivers at long range radar sites are investigated. The system, to be used as a redundant backup communication system, consists of controller position equipment, fast tuning multichannel transceivers, and a processor control device which connects the controller to the correct remote transceiver. Initial tests with the equipment were successful. E.H.W.

N72-28178# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
SYNCHRONIZATION OF ERROR DETECTION IN RADAR DATA TRANSMISSION [SYNCHRONISIERUNG UN FEHLERERKENNUNG BEI DER RADAR-DATENUEBERTRAGUNG]
E. Hanle Feb. 1970 29 p refs In GERMAN; ENGLISH summary
(Rept-142) Avail: NTIS HC $3.50

A radar data transmission system is proposed that uses pseudo random sequences for synchronization in dead transmission time, and simple parity information added to every data block in combination with the synchronization blocks for error detection. The system is used in connection with multi radar tracking using two radar systems with digital extractors and a data transmission unit to combine the data from both systems in one computer. The synchronization blocks of pseudo random character are produced in a feedback shift register, which also serves for fine control of the whole data transmission process. Simple parity information added to every block in combination with the synchronization block gives enough security against errors in transmission of radar information. ESRO

N72-28179# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
RESEARCH ON SEQUENTIAL DETECTION [UNTERSUCHUNGEN ZUR SEQUENTIAL-ENTDECKUNG]
W. D. Wirth Mar. 1970 35 p refs In GERMAN; ENGLISH summary
(Rept-144) Avail: NTIS HC $3.75

A sequential test procedure was investigated for target detection with phased array radar, and the mean test length is discussed. The problem of multiple range elements is emphasized. The distributions and mean values of the test length are derived. This was done in the case of independent testing of the range elements. The results are compared with those of Marcus and Swarling, whose test function was set up as the average over all individual test functions for the range elements. The range dependence of the signal amplitude is considered. Some criteria for truncation are given based on test length distribution. The loss of sensitivity for a fluctuating target signal is estimated for the most unfavorable case of target model. Some conclusions are given for the design of a special phased array radar system as an example. ESRO

N72-28180# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
AN ADAPTIVE PRE-WHITENING FILTER (DESCRIPTION OF THE ARITHMETIC UNIT) [EIN ADAPTIVES PRE-WHITENING-FILTER (BESCHREIBUNG DER RECHENEINHEIT)]
R. Klemm Dec. 1971 135 p refs In GERMAN; ENGLISH summary
(Rept-178) Avail: NTIS HC $8.75

The components and functions of an arithmetic unit are described which computes the pre-whitening filter function from real time autocorrelation values of cluttered radar data. The complete digital algorithm for a certain input function is given as a computer print-out. The equipment for adaptive clutter suppression consists of: a correlation which derives the autocorrelation function as information on the interference in real time, an arithmetic unit called adaptive clutter filter which calculates the weights for an optimal decorrelation filter using an iterative method. The arithmetic unit is described. It is a realization of an algorithm for suppression of interfering signals with known correlation functions. ESRO

N72-28181# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
EXPECTANCY AREAS WITH A MEASURING ERROR. PART 2: THE SYSTEM AND EXEMPLARY RESULTS [ERWARTUNGSGEBIETE MIT EINEM MESSFEHLER. 2: DAS SYSTEM UND EXEMPLARISCHE ERGEBNISSE]
L. Schuberth May 1971 84 p refs In GERMAN; ENGLISH summary
(Rept-124) Avail: NTIS HC $6.25

Expectation areas were calculated for single radar tracking as a function of several aircraft flight parameters and antenna revolutions. A program was developed for this purpose which enables processing plausible values of the parameters: (1) normal acceleration, (2) tangetial acceleration, (3) antenna and evolution time, and (4) maximum and minimum velocity. The program is capable of accepting variation in the parameters, for instance to simulate electronic radar. A description is given of the program system and examples are given of plotted expectation areas. ESRO

N72-28182# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
[PHASED ARRAY AND MULTIPLE RADAR RESEARCH ACTIVITIES] Annual Report, 1971 [JAHRESBERICHT 1971]
Jan. 1972 102 p In GERMAN
Avail: NTIS HC $7.25

The annual activity report for 1971 is presented, and special emphasis is given to research projects on experimental systems

such as an experimental computer based control and information system for radar data, and electronically controlled radar developments. Other activities reported on include the coherent dectection of moving radar targets in clutter and final work on a multi-radar system. ESRO

N72-28183# Army Electronic Proving Ground, Fort Huachuca, Ariz.
HF COSITE ANALYSIS (ECAC SUPPORT TASK 45 X 3). MEASUREMENT PLAN, REVISION 1
F. Stevenson Mar. 1972 58 p
(DA Proj. 1H6-62701-D-449)
(AD-739593; USAEPG-TP-721-Rev-1) Avail: NTIS CSCL 17/2

The objective of the test is to collect operational data on HF radio sets when operated under cosite conditions. The data are to be adequate for subsequent validation of the statistical cosite analysis model of another agency. Author (GRA)

N72-28184# Rensselaer Polytechnic Inst., Troy, N.Y. Systems Engineering Div.
THE KALMAN FILTER FOR THE EQUALIZATION OF DIGITAL COMMUNICATIONS CHANNEL
R. Lawrence and H. Kaufman 1971 17 p refs
(Contract DAAB07-69-C-0365)
(AD-739596) Avail: NTIS CSCL 09/4

Consideration is given to the use of the discrete Kalman filter as an equalizer for digital binary transmission in the presence of noise and intersymbol interference. When the channel is modeled as an n tap transversal filter, the Kalman filter assumes a similar form with feed forward and feedback. It is shown how the Kalman filter can be used to estimate both the tap weights and the binary signal. Computer results on a fixed six tap channel show that use of the six tap Kalman filter yields a considerably smaller error probability than when a conventional transversal equalizer with 15 taps is used. Limited computer studies on the same channel, assumed to be initially unknown, suggest that the Kalman filter is capable of converging rapidly in the adaptive mode. Author (GRA)

N72-28185# Rensselaer Polytechnic Inst., Troy, N.Y.
ON-LINE TRACKING OF SIX ORBITAL ELEMENTS OF A THRUST MANEUVERING SPACE VEHICLE
K. Yong and C. N. Shen 1971 34 p refs Submitted for publication
(Contract DAAB07-69-C-0365; Proj. Themis)
(AD-739599) Avail: NTIS CSCL 17/9

The problem of on-line tracking of the state variables of a thrust maneuvering space vehicle in three dimensional space described by non-linear discrete dynamical and measurement equations is studied for several different estimation schemes. A second order filtering relation is derived for a discrete non-linear plant which adds bias correction terms to the quasilinear filter. The rapid estimation scheme for a nonlinear system is employed both to provide the starting algorithm and whenever the state jump is detected. The digital computer evaluation indicates that the estimates of the states by the combination of a second order filter with the rapid estimation scheme is superior to the results obtained from quasilinear filtering techniques for the application of tracking the thrust maneuvering space vehicle. Author (GRA)

N72-28186# Rensselaer Polytechnic Inst., Troy, N.Y.
ADAPTIVE DIGITAL MTI DETECTION FILTERS
Rob Roy and Oscar Lowenschuss 1971 35 p refs Prepared in cooperation with Raytheon Corp., Bedford, Mass.
(Contract DAAB07-69-C-0365; Proj. Themis)
(AD-739603) Avail: NTIS CSCL 17/9

The paper has presented an on-line adaptive procedure for adjusting a digital MTI detection filter such that clutter residue is minimized. The procedure is based upon the evaluation of the ratio of mean square values of filtered and unfiltered signals. Since ratios are involved, the technique is implicitly normalized. Author (GRA)

N72-28187# Rensselaer Polytechnic Inst., Troy, N.Y. Systems Engineering Div.
ON-LINE EQUALIZATION OF DIGITAL COMMUNICATION CHANNELS
R. Lawrence and H. Kaufman 1972 4 p refs
(Contract DAAB07-69-C-0365)
(AD-739612) Avail: NTIS CSCL 09/4

Recovery of a signal after transmission through a communications channel can be aided by an adaptive equalizer. If the channel can be modelled by a weighted tapped delay line, then an extended Kalman filter can be used to estimate both the weighting coefficients and the transmitted signal, a binary input. Experimental results on a seven-tap channel imply that the extended Kalman filter can be used as a very effective on-line equalizer. Author (GRA)

N72-28188# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ELF NOISE PROCESSING
Andrew S. Griffiths 13 Jan. 1972 46 p refs
(Contract F19628-70-C-0230; AF Proj. 1508A)
(AD-739907; TR-490; ESD-TR-72-22) Avail: NTIS CSCL 17/2

The report describes noise processing experiments with ELF (3 to 300 Hz) atmospheric noise and signals in the 40- to 80-Hz range. The primary purpose of the experiments was to design the noise processing portion of a submarine-borne receiver which would minimize the required transmitter power of the Sanguine communications system. The recommended noise processor included a nonlinearity followed by a matched-filter and consisted of the following functions: (1) a compensating (or whitening) fiber, (2) a pre-notch filter clipper, (3) notch filters at power line frequencies, (4) a post-notch filter clipper, and (5) a phase-coherent linear matched filter. Author (GRA)

N72-28189# Yale Univ., New Haven, Conn. Dept. of Administrative Sciences.
INTERACTIVE MAN MACHINE COMMUNICATION Annual Report, 1 Feb. 1971 - 31 Jan. 1972
James H. Carlisle Mar. 1972 105 p refs
(Contract N00014-67-A-0097-0010; NR Proj. 049-293)
(AD-740101; TR-51) Avail: NTIS CSCL 17/2

A framework for the design and interpretation of experiments in man-computer interaction is described. The results of experiments utilizing the system-user behavior monitoring capability developed under this research are given, and specific design guidelines presented. AUTOGRP, an automated system for clustering data to produce decision information was used in the context of problems in medical decision-making in the experiments. A tutorial language, HELP, was developed to aid in the experiments and is described in the report. This language can be used to develop tutorial assistance for any interactive use of computers. GRA

N72-28190# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
A VOICE COMMUNICATION TESTING PROTOCOL: APPLICATION TO OXYGEN MASK SIERRA AND KOHLER COMBINATION VALVES Final Report, Mar. - Jun. 1971
Charles W. Nixon and Hill M. E. Nov. 1971 22 p refs
(AD-739889; AMRL-TR-71-106) Avail: NTIS CSCL 17/2

An investigation was made of relative voice communication efficiency of oxygen masks equipped with different respiration valves. A practical test protocol was established for quantifying oxygen mask voice communication performance. Oxygen mask voice communication with the standard Sierra Valve and with the proposed Kohler Valve were evaluated using the test protocol. A direct comparison of the findings revealed essentially no difference in voice communication efficiency, as determined by mean work intelligibility, between the two valves. Author (GRA)

N72-28191# Honeywell, Inc., Hopkins, Minn. Government and Aeronautical Products Div.
RESEARCH AND DEVELOPMENT OF A DC-DC CONVER-

TER Semiannual Report, 1 Jun. - 31 Dec. 1971
J. T. Lingle and L. V. Westbrook Mar. 1972 68 p
(Contract DAAB07-71-C-0223; DA Proj. 1T6-627C5-A-053)
(AD-739996; ECOM-0223-1) Avail: NTIS CSCL 09/5

The purpose of the program was to develop a reliable, efficient, cost effective, high-density source capable of remote operation under a wide range of temperature variations for at least 3000 hours. To accomplish these objectives, it was necessary to analyze the battery-converter-regulator system configuration tradeoffs and to determine the optimum approach for efficiently matching the characteristics of new organic electrolyte lithium batteries and zinc air batteries to the characteristics of communications and surveillance equipment. This document describes the block diagram circuit analysis and computer-aided tradeoff studies and discusses initial breadboard circuit operation. Author (GRA)

N72-28192# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
THE EFFECTS OF LIMITERS ON THE DETECTION OF NARROW BAND SIGNALS IN BROAD BAND NOISE
Raymond C. Johnson 8 Mar. 1972 35 p refs
(Contract DAAG39-70-C-0058; HDL Proj. 16114; DA Proj. 1B2-62301-A-208)
(AD-739937; SR-72-2; HDL-0058-7) Avail: NTIS CSCL 09/4

The effects of hard limiting on a narrow-band signal in broad-band Gaussian noise is analyzed. The post-limiting spectrum of the noise is shown to be a function not only of the signal-to-noise ratio (SNR) applied to the limiter but also of the frequency (f sub 0) of the signal within the bandwidth (B) of the noise. The output signal-to-noise ratio is computed for a narrow-band filter following the limiter and centered on the signal frequency. For large input SNR, the output SNR is shown to be improved by a factor of 2 if the signal frequency is greater than B/3 and to be degraded by the factor 4 f sub 0/B if the signal frequency is located in the lower frequency region of the noise band. Author (GRA)

N72-28193# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ELF PROPAGATION STUDY (PHASE 2: FALL 1972).
David P. White and Donald K. Willim 15 Feb. 1972 175 p refs
(Contract F19628-70-C-0230; AF Proj. 1508A)
(AD-739871; ESD-TR-72-54; TN-1972-1) Avail: NTIS CSCL 20/14

An experimental measurement program has been undertaken to determine the parameters for propagation in the 40 and 70 Hz range. A transmitter in Wisconsin (WTF) transmitted simple sinusoidal signals for two eight-hour periods per day for 20 days. The radiated power was 1/4 watt at 45 Hz and 1/2 watt at 75 Hz. Receiver sites were located in Utah, Nova Scotia and Hawaii. Subject to the constraints detailed in the text, estimates of the attenuation rates and the mode excitation factors have been determined with high accuracy. The daytime attenuation rates were found to be higher than those estimated previously on the basis of theoretical calculations. The nighttime excitation factor was also found to be a few dB smaller than previously expected. Author (GRA)

N72-28949* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ANALYSIS OF THE FAILURE OF A POLYESTER PERIPHERAL DRIVE BELT ON THE MARINER MARS 1971 FLIGHT TAPE RECORDER
E. F. Cuddihy *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 82-99 ref (For availability see N72-28941 19-34)
CSCL 14C

N72-28950* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
STUDIES ON THE FRICTIONAL BEHAVIOR OF MAGNETIC RECORDING TAPES
S. H. Kalfayan, R. H. Silver, and J. K. Hoffman *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1. Apr. 1972 p 100-106 refs (For availability see N72-28941 19-34)
CSCL 14C

N72-28955* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
INTERPLEX: AN ANALYSIS OF OPTIMIZED POWER ALLOCATIONS FOR TWO AND THREE CHANNEL PSK/PM TELECOMMUNICATIONS SYSTEMS
B. K. Levitt *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 143-151 refs (For availability see N72-28941 19-34)
CSCL 17B

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N72-28194 National Lending Library for Science and Technology, Boston Spa (England).
SPC SWITCHING: SIMULATION OF ENVIRONMENT
G. Gastaud and J. Trelut 30 Mar. 1972 15 p refs Transl. into ENGLISH from Commutation et Electronique (Issy-les-Moulineaux), no. 35, Oct. 1971 p 85-91
(NLL-Trans-2830-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The simulation techniques used to develop an environment for telephone switching exchange system are given. Data cover choice of simulation type, simulation interface, language of events, principles of simulation programs, output of results, and the type of facility using the exchange system. E.H.W.

N72-28195 British Broadcasting Corp., Kingswood (England). Engineering Div.
FIELD-STORE STANDARDS CONVERSION: A TECHNICAL DESCRIPTION OF THE C06/508 CONVERTER
G. M. LeConteur Jun. 1972 18 p refs
(BBC-1972/22) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Many aspects of design in this converter are the same as, or similar to those used in the earlier C06/506 converter which converts 525/60 NTSC signals to the 625/50 PAL standard. The two converters are compared, pointing out any areas of special interest. Reference is also made to the additional synchronizing capability of the C06/508 converter. Author

N72-28196*# Information Research Associates, Inc., San Antonio, Tex.
RELIABILITY TECHNIQUES FOR COMPUTER EXECUTIVE PROGRAMS
17 May 1972 91 p refs
(Contract NAS8-2666-9)
(NASA-CR-123736) Avail: NTIS HC $6.75 CSCL 09B

Computer techniques for increasing the stability and reliability of executive and supervisory systems were studied. Program segmentation characteristics are discussed along with a validation system which is designed to retain the natural top down outlook in coding. An analysis of redundancy techniques and roll back procedures is included. F.O.S.

N72-28197*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
ROBOT COMPUTER PROBLEM SOLVING SYSTEM Quarterly Progress Report, 23 Feb. - 22 May 1972
Joseph D. Becker 15 Jun. 1972 26 p
(Contract NASw-2236)
(NASA-CR-127445; QPR-3) Avail: NTIS HC $3.50 CSCL 09B

Continuing research is reported in a program aimed at the

development of a robot computer problem solving system. The motivation and results are described of a theoretical investigation concerning the general properties of behavioral systems. Some of the important issues which a general theory of behavioral organization should encompass are outlined and discussed.
D.L.G.

N72-28198*# Cornell Univ., Ithaca, N.Y. School of Electrical Engineering.
STUDY OF SEQUENTIAL DECODING Final Report
Frederick Jelinek Feb. 1972 241 p refs
(Contract NAS2-5643)
(NASA-CR-114450) Avail: NTIS HC $14.25 CSCL 09B

Sequential decoding problems considered deal with reliable transmission through noise space channels and encoding of space sources for the purpose of data suppression. G.G.

N72-28199# Illinois Univ., Urbana. Dept. of Computer Science.
A BRANCH-AND-BOUND ALGORITHM FOR OPTIMAL NOR NETWORKS (THE ALGORITHM DISCRIPTION)
Tomoyasu Nakagawa and Hung-Chi Lai Apr. 1971 30 p refs
(Grant NSF GJ-503)
(Rept-438) Avail: NTIS HC $3.50

The branch-and-bound algorithm is applied to the synthesis problem of optimal combinational networks for arbitrary switching functions using NAND gates, by introducing the desirability order and other speed improvement gimmicks. The algorithm for NOR gates is implemented by using simpler heuristics by incorporating a new gimmick called redundancy check. A description of the branch-and-bound method is given. Author

N72-28200*# Teledyne Brown Engineering, Huntsville, Ala. Systems Design and Simulation Branch.
SHUTTLE OPERATIONS SIMULATION MODEL PROGRAMMERS'/USERS' MANUAL Summary Report
D. G. Porter Jun. 1972 132 p refs
(Contract NAS8-21804)
(NASA-CR-123735; ASD-ASTN-1533) Avail: NTIS HC $8.75 CSCL 09B

The prospective user of the shuttle operations simulation (SOS) model is given sufficient information to enable him to perform simulation studies of the space shuttle launch-to-launch operations cycle. The procedures used for modifying the SOS model to meet user requirements are described. The various control card sequences required to execute the SOS model are given. The report is written for users with varying computer simulation experience. A description of the components of the SOS model is included that presents both an explanation of the logic involved in the simulation of the shuttle operations cycle and a description of the routines used to support the actual simulation. Author

N72-28201# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
OMNITAB 2 SEGMENTATION STRUCTURE FOR THE SCOPE OPERATING SYSTEM
Sally T. Peavy and Ruth N. Varner Jun. 1972 27 p refs
(NBS Proj. 1510585)
(NBS-TN-734) Avail: SOD $0.35 as C 13.46:734 CSCL 09B

OMNITAB 2 is an interpretive system developed and maintained in order to enable scientists to use a large computer easily, effectively and accurately for numerical, statistical and data analysis without prior computer experience. The system is as machine independent as possible, making implementation relatively easy. Since OMNITAB 2 has a large memory requirement, segmentation and overlay are virtually essential. Overlay procedures are dependent upon the operating system of the computer. Described is a method of segmentation and overlay for a particular operating system (CDC-6000 series). The method can readily be adapted to other operating systems with modifications to the control statements. Author

N72-28202*# Brown Univ., Providence, R.I. Center for Computer and Information Sciences.
THE COMPLEXITY OF DETERMINISTIC SOURCE ENCODING WITH A FIDELITY CRITERION
John E. Savage May 1971 17 p refs
(Grants NGR-40-002-082; NGR-40-002-090; NSF GK-13162)
(NASA-CR-127705) Avail: NTIS HC $3.00 CSCL 09B

Block encoding of discrete, memoryless sources with equiprobable outputs subject to a fidelity critereon is discussed. The encoder is assumed to be deterministic and a lower bound is derived on the amount of computational work required to encode such sources as a function of the code rate and fidelity of the encoding. An example is given to show that the bound cannot be substantially improved. These bounds apply primarily to sources and distortion measures which are such that the minimum distortion given by the rate-distortion bound is not achievable with a finite block length, deterministic encoder.
Author

N72-28203*# Brown Univ., Providence, R.I. Center for Computer and Information Sciences and Div. of Engineering.
COMPUTATIONAL WORK AND TIME ON FINITE MACHINES
J. E. Savage Jun. 1971 48 p refs Prepared in cooperation with JPL
(Contract NAS7-100; Grants NGR-40-002-082; NGR-40-002-090; NSF GK-13162)
(NASA-CR-127694) Avail: NTIS HC $4.50 CSCL 09B

Measures of the computational work and computational delay required by machines to compute functions are given. Exchange inequalities are developed for random access, tape, and drum machines. Product inequalities between storage and time, number of drum tracks and time, number of bits in an address and time, etc., must be satisfied to compute finite functions on bounded machines. Criteria for the design and use of general purpose computers are developed, and applications of the exchange inequalities are made to the language recognition problem. Author

N72-28204*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SPEED IN INFORMATION PROCESSING WITH A COMPUTER DRIVEN VISUAL DISPLAY IN A REAL-TIME DIGITAL SIMULATION M.S. Thesis - Virginia Polytechnic Inst.
Robert Gordon Kyle Jun. 1972 79 p refs
(NASA-TM-X-68684) Avail: NTIS HC $6.00 CSCL 09B

Information transfer between the operator and computer-generated display systems is an area where the human factors engineer discovers little useful design data relating human performance to system effectiveness. This study utilized a computer-driven, cathode-ray-tube graphic display to quantify human response speed in a sequential information processing task. The performance criteria was response time to sixteen cell elements of a square matrix display. A stimulus signal instruction specified selected cell locations by both row and column identification. An equal probable number code, from one to four, was assigned at random to the sixteen cells of the matrix and correspondingly required one of four, matched keyed-response alternatives. The display format corresponded to a sequence of diagnostic system maintenance events, that enable the operator to verify prime system status, engage backup redundancy for failed subsystem components, and exercise alternate decision-making judgements. The experimental task bypassed the skilled decision-making element and computer processing time, in order to determine a lower bound on the basic response speed for given stimulus/response hardware arrangement. Author

N72-28205# Software Science Ltd., Farnborough (England).
STUDY OF REAL TIME LANGUAGE Final Report and Recommendations
Jan. 1972 93 p Sponsored by ESRO

(ESRO-CR-(P)-101) Avail: NTIS HC $6.75

The comparison of real time programming languages for satellite flight control at the European Space Operations Center is reported. The comparison is based on storage aspects, data description, file handling, device handling, program structure, computing power, portability, mixed programming, and segmentation. The languages considered in the study were: ALGOL 68, ASTRE, CLASP, CORAL 66, FORTRAN, JOVIAL, MITOL, NELIAC 71, PL1, RTL (BCS), RTL/1 and RTL/2, SPL, TACPOL, and TPL2. It is concluded that two languages are appropriate to the needs of the center: RTL/2, a language under development at the Central Instrument Research Laboratory of ICI, and CORAL 66, a language developed by the Royal Radar Establishment. ESRO

N72-28206# Rensselaer Polytechnic Inst., Troy, N.Y. Systems Engineering Div.

MINICOMPUTER STUDENT PROJECTS IN ON-LINE COMMUNICATIONS SIGNAL PROCESSING AND OPTIMAL CONTROL

Lester A. Gerhardt and Howard Kaufman 1972 8 p refs

(Contract DAAB07-69-C-0365; Proj. Themis)

(AD-739611) Avail: NTIS CSCL 09/2

Two Master's level student projects are described stressing the on-line real time use of a minicomputer as an element of an overall system. Emphasis is placed on using the dedicated minicomputer as an integral part of the system being developed and as a systems tool rather than as a simulator. The specific aspects of the dedicated minicomputer which makes it well suited for engineering applications and for use in student projects as well as the educational benefits derived from these types of individual projects are discussed. The two projects in communications and controls are then described in detail including their results. Author (GRA)

N72-28207# Naval Research Lab., Washington, D.C.

SIMULATION OF AADC SIMPLEX AND MULTIPROCESSOR OPERATION Interim Report

William R. Smith 29 Feb. 1972 118 p

(WF15241601)

(AD-739738; NRL-7356) Avail: NTIS CSCL 09/2

Simulation of a proposed Naval Advanced Avionic Digital Computer (AADC) has been underway to arrive at architectures which efficiently meet the needs of expected program workloads. Models of avionic program workloads have been derived from various sources and used to drive these simulations . These models consist of sets of nearly independent program modules which effect periodic, known demands on system resources. Simplex and multiprocessor configurations of the AADC have been modeled, and certain features of proposed AADC executive operation have been incorporated into these models. Guided by previous simulation work, both nonpaged and paged operating systems with multiprogrammed memories have been simulated. Author (GRA)

N72-28208# Iowa Univ., Iowa City. Dept. of Mathematics.

AN APPLICATION OF TREE AUTOMATA TO LINEAR AND SKEWLINEAR TUPLE LANGUAGES

Oliver L. Costich Feb. 1972 21 p refs

(Contract N00014-68-A-0500)

(AD-740087; TR-51) Avail: NTIS CSCL 09/2

The theory of tree automata is applied to a class of linear languages and to the skewlinear tuple languages. Closure and decidability properties are studied and analogues of the classical characterizations of Kleene and Myhill are derived. Author (GRA)

N72-28209# Yale Univ., New Haven, Conn. Dept. of Administrative Sciences.

AUTOGRP: AUTOMATED GROUPING SYSTEM USER'S MANUAL

Ronald E. Mills, Robert B Fetter, and James H. Carlisle Jan. 1972 85 p

(Contract N00014-67-A-0097-0010; Grant HS-00163-05)

(AD-740104; TR-52) Avail: NTIS CSCL 09/2

AUTOGRP is an extensible computer language designed to permit a high degree of man-computer interaction in the analysis of numerical data. A command language is provided for the user which permits execution of numerous statistical computations on specified portions of a database, the option for the user to vary parameters in several of the computations, the option to rename commands, alter the syntax of commands and even program new commands in a real time mode. Special emphasis has been given to the design of a user language which is English-like, concise and unambiguous, with consistency of grammar across commands. Commands are interpreted and executed by a table driven syntax analyzer which itself can be reprogrammed while the system is in use. Author (GRA)

N72-28210# Naval Personnel and Training Research Lab., San Diego, Calif.

FEASIBILITY OF COMPUTER GENERATED DATA DISPLAYS IN THE AUTOMATED PERFORMANCE EVALUATION SYSTEM

David W. Robertson, Jim James, and Marjorie H. Royle Apr. 1972 31 p refs

(AD-740086; SRR-72-20) Avail: NTIS CSCL 09/2

A method for providing selection boards and detailers with a timely and accurate evaluation of individual on-job performance is essential if valid decisions are to be made in selecting individuals for advancement, duty-assignment, training or quality retention. Four formats and data sets are presented which demonstrate the feasibility and utility of computer-generated displays of performance evaluation data. Author (GRA)

N72-28211# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.

STUDY OF DOD AUTOMATED ENVIRONMENTAL SERVICES SUPPORT SYSTEMS: REPORT OF FINDINGS

Alan J. Grobecker, Richard P. Brennan, Kenneth P. Heinze, Joseph E. Wirsching, and Charles W. Stevenson Jun. 1971 128 p

(Contract DAHC15-67-C-0011)

(AD-740078; S-382; IDA/HQ-71-12476) Avail: NTIS CSCL 09/2

The Report of Findings of IDA Study S-382 examines the feasibility of collocation and/or consolidation of the Navy and Air Force operational environmental services computer centers--both as they are presently constituted and as expanded to meet 1975 needs. This document summarizes the findings of this study which are reported in detail in the Appendices. Subjects reviewed are: the current operations of the Fleet Numerical Weather Central and the Air Force Global Weather Central, the DoD needs for environmental services, potential data sources which the Services might utilize to meet military needs in 1975, data processing equipment and personnel requirements based on military needs for this same period, costs of the various options open to DoD, and a review of the pros and cons of these options. Author (GRA)

N72-28212# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

C.mmp: THE CMU MULTIMINIPROCESSOR COMPUTER. REQUIREMENTS AND OVERVIEW OF THE INITIAL DESIGN

C. G. Bell, W. Broadley, W. Wulf, A. Newell, C. Pierson, R. Reddy, and S. Rege 24 Aug. 1971 62 p refs

(Contract F44620-70-C-0107; AF Proj. 9769)

(AD-739963; CMU-CS-72-112; AFOSR-72-0772TR) Avail: NTIS CSCL 09/2

The document describes a proposed CMU multiprocessor system to be constructed around a set of PDP-11 computers connected through a crosspoint switch to a large sharable primary memory. The present design constitutes a solution to a specific set of needs existing in our environment. The system

has research consequences that reach well beyond the particular demands it was designed to satisfy. For although multiprocessors have been much talked about and advocated, there are remarkably few operational systems more complex than dual-processor systems, and even fewer documented scientific investigations into their performance and operating structure. This document is limited to a presentation and analysis of the (hardware) system. It gives enough description of the usage requirements, software, and the research potentials and problems to make clear why the authors believe the effort to be a sound one. Author (GRA)

N72-28213# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
A BASIC LANGUAGE FOR THE IMPLEMENTATION OF SYSTEM SOFTWARE FOR THE PDP-11. BLISS/11 REFERENCE MANUAL
W. Wulf, J. Apperson, R. Brender (Digital Equipment Corp.), C. Geschke, P. Knueven (Digital Equipment Corp.), C. Weinstock, J. Zarrella, and O. Wile 24 Aug. 1971 63 p refs
(Contract F44620-70-C-0107)
(AD-739964; AFOSR-72-0773TR) Avail: NTIS CSCL 09/2

The document describes the BLISS implementation language as written for the PDP-11. BLISS is a language specifically designed for use as a tool in implementing large software programs. Special attention is given in the language design to the requirements of the systems programming task, such as: space and time efficiency, the representation of data structures, the lack of run-time support facilities, flexible control structures, modularization, and parameterization of programs. Author (GRA)

N72-28214# Worcester Polytechnic Inst., Mass. Dept. of Electrical Engineering.
ON-LINE DATA ANALYSIS WITH A HYBRID COMPUTER Interim Report
Owen W. Kennedy, Jr. and Donald C. Eteson Dec. 1971 36 p refs
(Contracts F19628-69-C-0125; F19628-68-C-0040)
(AD-739926; AFCRL-71-0607; SR-2) Avail: NTIS CSCL 09/2

Hybrid computer programs were developed to accept data in analog form and simultaneously to perform selected analysis and reduction procedures in real time, the results appearing as continuous analog outputs. Analog circuits with parallel logic removed interference spikes from the original data and formed continuous records of the average and root-mean-square values of each of two input signals plus the correlation coefficient of these two signals. Hybrid programs calculated, and outputed as a repetitive cathode-ray-tube display, the amplitude probability density and the auto/cross correlation function. Parallel hybrid circuits continuously detected the peak values of the repetitive correlation displays, and the values of time shift at which the peaks occurred, and produced continuous strip-chart records of these quantities. Author (GRA)

N72-28215# Army Chemical Center, Edgewood, Md.
PROCEEDINGS OF MEETING ON ENVIRONMENTAL POLLUTION (1ST)
Elmer Engquist, comp. Feb. 1972 96 p Meeting held at Edgewood Arsenal, Md., 15-16 Apr. 1970; sponsored by Am. Ordnance Assoc.
(AD-738544; EA-SP-100-78) Avail: NTIS CSCL 13/2

The report contains the papers presented at Edgewood Arsenal on 15 and 16 April 1970 at the First Meeting on Environmental Pollution sponsored by the American Ordnance Association. The papers were presented by representatives of Department of Defense, industry, and predecessor organizations of the Environmental Protection Agency (National Air Pollution Control Administration, Bureau of Solid Waste Management, and Federal Water Pollution Control Administration). Topics include solid and liquid waste disposal, water and air pollution control, and air monitoring techniques. Author (GRA)

N72-28216# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
STUDY OF DOD AUTOMATED ENVIRONMENTAL SERVICES SUPPORT SYSTEMS. APPENDIX B: NAVY ENVIRONMENTAL SUPPORT SERVICES IN 1970
Alan J. Grobecker Jun. 1971 148 p refs
(Contract DAHC15-67-C-0011)
(AD-740079; S-382-App-B; IDA/HQ-71-12448-App-B) Avail: NTIS CSCL 09/2

The Appendix to IDA Study S-382 describes the Navy environmental support system as it exists in 1970, with the emphasis on the computer operations at Fleet Numerical Weather Central Monterey. Activities at FNWC are chiefly concerned with development of the basic fields and applications of weather and oceanographic elements. The utilization of the two CDC 6500s at FNWC is divided about equally between the troposphere and the oceans. The tropospheric effort may be divided fractionally between data preprocessing, analysis, prognosis, and applications in the following proportions: 0.02/0.2/0.2/0.6. Similarly, the oceanic effort is divided in the following proportions: 0.01/0.01/0.001/0.98. Author (GRA)

N72-28217# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
STUDY OF DOD AUTOMATED ENVIRONMENTAL SERVICES SUPPORT SYSTEMS. APPENDIX C: AIR FORCE/ARMY ENVIRONMENTAL SUPPORT SERVICES IN 1970
Alan J. Grobecker Jun. 1971 164 p refs
(Contract DAHC15-67-C-0011)
(AD-740080; S-382-App-C; IDA/HQ-71-12455-App-C) Avail: NTIS CSCL 09/2

The Appendix to IDA Study S-382 describes the Air Force/Army environmental support system as it exists in 1970, with the emphasis on the computer operations of the Air Force Global Weather Central (AFGWC), Omaha. AFGWC is the hub of a worldwide system for gathering and processing environmental data. The effort of AFGWC is principally concerned with the troposphere and the lower stratosphere, with emphasis on providing automatic realtime response to queries. The use of the four Univac 1108s at AFGWC is divided among data preprocessing, analyses, prognoses, and applications in proportions 0.01/0.3/0.2/0.5. Author (GRA)

N72-28218# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
STUDY OF DOD AUTOMATED ENVIRONMENTAL SERVICES SUPPORT SYSTEMS. APPENDIX D: SOURCES OF DATA FOR DOD ENVIRONMENTAL SERVICES SUPPORT SYSTEMS OF 1975 - 1980
Alan J. Grobecker Jun. 1971 132 p refs
(Contract DAHC15-67-C-0011)
(AD-740081; S-382-App-D; IDA/HQ-71-12456-App-D) Avail: NTIS CSCL 09/2

The Appendix to IDA Study S-382 describes some principal data sources which the DoD may exploit to meet military needs for environmental data in the period 1975-1980. The purpose of this Appendix is to contribute to estimations of future DoD environmental support services computer requirements. The currently conventional sources of meteorological data are described. It is concluded that while military exploitation of these conventional sources may continue in the future, its dependence on the cooperation of foreign nations is a sensitive vulnerability. As a chief source of new data, the potential of satellite systems and of new ocean data collection systems is examined. A hypothetical exemplar satellite system is envisioned and compared to satellites programmed by NASA and NOAA. A hypothetical exemplar ocean data collection platform is also envisioned and compared to present and planned ocean data collection systems. Author (GRA)

N72-28219# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
STUDY OF DOD AUTOMATED ENVIRONMENTAL

SERVICES SUPPORT SYSTEMS. APPENDIX E: NUMERICAL SIMULATION OF GLOBAL CIRCULATION OF THE ATMOSPHERE UP TO AN ALTITUDE OF 300 km
Alan J. Grobecker Jun. 1971 128 p refs
(Contract DAHC15-67-C-0011)
(AD-740082; S-382-App-E; IDA/HQ-71-12457-App-E) Avail: NTIS CSCL 09/2

The Appendix to IDA Study S-382 describes a numerical model for the global stratosphere, mesosphere, and thermosphere. The model is intended to be used solely as a basis for estimating the size of the computational problem. The model attempts to define the motions of the atmosphere, including the troposphere, up to altitudes of 300 kilometers. Only those atmospheric motions which are of horizontal scale lengths greater than 1000 km and of vertical scale lengths greater than 10 km are considered. Annexes to this document detail various factors to be considered in specifying a model of the upper atmosphere.
Author (GRA)

N72-28220# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
STUDY OF DOD AUTOMATED ENVIRONMENTAL SERVICES SUPPORT SYSTEMS. APPENDIX F: DATA PROCESSING FOR DOD ENVIRONMENTAL SERVICES SUPPORT SYSTEMS FOR 1975-1980
Joseph E. Wirsching and Charles W. Stevenson Jun. 1971 86 p refs
(Contract DAHC15-67-C-0011)
(AD-740090; S-382-App-F; IDA/HQ-71-12458-App-F) Avail: NTIS CSCL 09/2

The Appendix to IDA Study S-382 describes requirements for data processing implied by a projection of DoD needs for environmental services support for the period 1975-1980. Large-scale computer systems and associated peripheral equipment are reviewed and subsequently related to applications in the three environmental domains of interest: the troposphere, the oceans, and the stratosphere and above. This material is used as the basis for anticipating the possible equipment needs of the Department of Defense during the period 1975 to 1980. Several alternative time-phased plans are presented for the construction of buildings, installation of computing facilities, and the personnel required to carry out the plan. Personnel and equipment needs are estimated for four basic alternatives: separate Navy and Air Force facilities with no expansion to meet future military needs, collocated Navy and Air Force facilities with no expansion of capability, separate Navy and Air Force facilities with the capability of meeting projected 1975 requirements, and a collocated or consolidated Navy/Air Force facility with the equipment and personnel capable of meeting 1975 military needs.
Author (GRA)

N72-28221# Institute for Defense Analyses, Arlington, Va.
STUDY OF DOD AUTOMATED ENVIRONMENTAL SERVICES SUPPORT SYSTEMS. APPENDIX G: COSTS OF A SPECTRUM OF OPTIONS FOR DATA PROCESSING OF DOD ENVIRONMENTAL SERVICES SUPPORT SYSTEMS OF 1975-1980
Kenneth P. Heinze Jun. 1971 65 p refs
(Contract DAHC15-67-C-0011)
(AD-740091; S-382-App-G) Avail: NTIS CSCL 09/2

Examined are costs of a selected set of options open to DOD regarding the feasibility of collection and/or consolidation of the Navy and Air Force environmental services computer centers. Costs are developed for four basic options: Separate Navy and Air Force facilities with no expansion to meet future military needs; collocated Navy and Air Force facilities with no expansion of capability; separate Navy and Air Force facilities with the capability of meeting projected 1975 requirements; and a collocated or consolidated Navy/Air Force facility with the equipment and personnel capability of meeting 1975 military needs. Equipment lists personnel needs, and the time-phased implementation plans that are the bases of the cost estimates are given.
Author (GRA)

N72-28222# Maryland Univ., College Park. Computer Science Center.
A STUDY OF NEW IMAGE PROCESSING TECHNIQUES, 2 Interim Scientific Report
Edward S. Deutsch, Michael N. Fritz, and Andrew Pilipchuk Nov. 1971 63 p ref
(Contract F19628-70-C-0208; AF Proj. 5628)
(AD-739925; SR-6; AFCRL-71-0596-Pt-2) Avail: NTIS CSCL 09/2

The report consists of two independent parts. The first part discusses the idea of iterating the conversion of a continuous-tone picture from binary to gray code representation. A simple recursive function is defined by means of which the value of the ith bit representing a picture point's grey level after the mth iteration is determined. The resulting rearrangement of grey levels as well as that of the bits throughout the planes is discussed. The second part of the report contains information regarding the high-resolution digital picture output system developed at the University of Maryland.
Author (GRA)

N72-28223# System Development Corp., Santa Monica, Calif.
USER ADAPTIVE LANGUAGE (UAL): A STEP TOWARD MAN-MACHINE SYNERGISM
Aiko Hormann, Antonio Leal, and David Crandell 28 Jun. 1971 64 p refs
(Contract DAHC15-67-C-0149; ARPA Order 1327-3)
(AD-728981; SDC-TM-4539/000/01) Avail: NTIS CSCL 09/2

The User Adaptive Language (UAL) is designed to provide a convenient and flexible means for man-machine communication in cooperative problem-solving/decision-making efforts. The language is extensible and functionally oriented with user control of evaluation and data manipulation. The interactive nature of UAL provides a conversational environment conducive to dynamic decision making. The syntax of UAL is simple and straightforward. The function definition features provide a means of creating new terms and primitives allowing a higher level of sophistication in the communication of ideas. The new functions may be compact and stylized or English-like in their use. Consequently, the problem solver is free to concentrate on what to say rather than how to say it. UAL can be a powerful tool in building systems in which man and machine can work together to complement each other's capabilities.
Author (GRA)

N72-28954* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
OPERATING EXECUTIVE FOR THE DSIF TRACKING SUBSYSTEM SOFTWARE
P. L. Poulson *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 135-142 ref (For availability see N72-28941 19-34)
CSCL 09B

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N72-28224 National Lending Library for Science and Technology, Boston Spa (England).
CONSTRUCTION AND TESTING OF COAXIAL TUBULAR RESISTANCES WITH VERY SHORT RISE TIMES
W. Pfeiffer 11 May 1972 7 p refs Transl. into ENGLISH from Eleotrotech. Z., A (Berlin), v. 91, no. 1, 16 Jan. 1970 p 59-60 In ENGLISH and GERMAN
(NLL-AR-Trasn-591-(9022.823)) Avail: Natl. Lending Library, Boston Spa, Engl: 1 NLL photocopy coupon

An attempt was made to lower the rise time of coaxial tubular resistances to 0.4 ns. The problem was solved by: (1)

placing a resistance coating of copper on a vaporized carbon resistance, and (2) placing a NiCr resistance coating on a varcromium film resistance. Results show tubular resistances of 0.4 ns may be realized if suitable resistance coatings and a maximum length of 3 cm are used. E.H.W.

N72-28225* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ELECTRICAL CONNECTOR Patent

Wilhelm Angele and Hans G. Martineck, inventors (to NASA) Issued 13 Jun. 1972 10 p Filed 21 Apr. 1971 Supersedes N71-34211 (09-21, p 3403)

(NASA-Case-MFS-20757; US-Patent-3,670,290; US-Patent-Appl-SN-136006; US-Patent-Class-339-75MP; US-Patent-Class-339-94M; US-Patent-Class-339-176MF; US-Patent-Class-339-218M) Avail: US Patent Office CSCL 09A

A separable flat cable connector has pairs of mating electrical contacts fully isolated from one another by means of insulating compartments extending rearward from the mating face of the plug half. The plug body is an integral, molded plastic member with two rows of compartments separated by a central wall. Two flat conductor cables, introduced through the rear of the plug, have exposed conductors extending forward along the central wall, with the conductor ends secured in grooves defined by projections on the central compartment wall spaced back from the mating face. The receptacle half of the connector has an outer housing adapted to receive the plug body and forward-projecting spring contact elements with arc surface for engagement with the exposed conductors in the plug. Spring contact elements of the receptacle are disposed so that their rearwardly extending ends are aligned in four spaced rows to facilitate soldering thereto of conductors of round wire or flat conductor cables. Official Gazette of the U.S. Patent Office

N72-28226*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

APOLLO 14 MISSION CIRCUIT BREAKER ANOMALY Anomaly Report No. 4

Dec. 1971 5 p

(NASA-TM-X-68391; MSC-05814) Avail: NTIS HC $3.00 CSCL 09A

Continuity through the circuit breaker in the mechanically closed condition was prevented by a foreign substance on the contact surface onboard Apollo 14. It was concluded that this was the only failure of this type in over 3400 units that were flown, and since no circuit breaker is a single-point failure for crew safety or mission success, no corrective action was taken. Author

N72-28227*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ELECTRON BEAM CONTROLLER Patent Application

Henry G. Kosmahl, inventor (to NASA) Filed 27 Jun. 1972 11 p

(NASA-Case-LEW-11617-1; US-Patent-Appl-SN-266832) Avail: NTIS HC $3.00 CSCL 09C

A method and apparatus for refocusing a spent electron beam before it is injected into a collector to achieve maximum efficiency is reported. Such an arrangement is particularly advantageous in a microwave electron tube. Provided are magnetic fields of selected intensities for refocusing and stabilizing the electron beam over axial lengths which have a predetermined relationship to the wavelength of operation. NASA

N72-28228*# Columbia Univ., New York. Faculty of Pure Science.

CURRENT CONDUCTION IN JUNCTION GATE FIELD EFFECT TRANSISTORS Ph.D. Thesis

Choong-Ki Kim 1970 137 p refs

(Grants NGR-33-008-090; NSF GK-1550)

(NASA-CR-127481) Avail: NTIS HC $9.00 CSCL 09A

The internal physical mechanism that governs the current conduction in junction-gate field effect transistors is studied. A numerical method of analyzing the devices with different length-to-width ratios and doping profiles is developed. This method takes into account the two dimensional character of the electric field and the field dependent mobility. Application of the method to various device models shows that the channel width and the carrier concentration in the conductive channel decrease with increasing drain-to-source voltage for conventional devices. It also shows larger differential drain conductances for shorter devices when the drift velocity is not saturated. The interaction of the source and the drain gives the carrier accumulation in the channel which leads to the space-charge-limited current flow. The important parameters for the space-charge-limited current flow are found to be the L/L sub DE ratio and the crossover voltage. Author

N72-28229# Radio Technical Commission for Aeronautics, Washington, D.C.

MINIMUM PERFORMANCE STANDARDS: AIRBORNE ATC TRANSPONDER EQUIPMENT

17 Mar. 1972 57 p Supersedes DO-112

(DO-150; RTCA-SC-115; ICG-11; DO-112) Avail: NTIS; RTCA Secretariat, Suite 655, 1717 H Street N. W. Washington, D. C. 20006: HC $6.00

Minimum performance standards for airborne ATC transponder equipment for use in the ATC radar beacon system are defined. Compliance with these standards by manufacturers and users is recommended as a means of assuring that the equipment will satisfactorily perform its intended function under all conditions normally encountered in routine aeronautical operations. Author

N72-28230*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

PROCEDURE FOR POTTING ELECTRICAL CABLE ASSEMBLY TERMINATIONS

Harold F. Williams 5 May 1972 11 p refs

(NASA-TM-X-68690; KSC-GP-896) Avail: NTIS HC $3.00 CSCL 09A

Procedures for the safe cleaning and potting of cable assembly terminations are given. Data cover primer application and injection of the potting compound. Required safety precautions for the process are listed. E.H.W.

N72-28231*# Magnavox Co., Silver Spring, Md. Government and Industrial Div.

A PSEUDO-NOISE TRANSPONDER DESIGN FOR LOW DATA RATE USERS OF THE TRACKING AND DATA RELAY SATELLITE SYSTEM Final Report

J. N. Birch 2 Dec. 1971 183 p refs

(Contract NAS5-20209)

(NASA-CR-122500; ASAO-PR20026-4) Avail: NTIS HC $11.25 CSCL 09E

A compromise optimum design for the low data rate users of the Tracking and Data Relay Satellite System (TDRSS) is presented. Design goals for the TDRSS are employed in this report to arrive at the transponder design. Multipath, R.F.I., antenna pattern anomolies, other user signals, and other definable degrading factors are included as trade-off parameters in the design. Synchronization, emergency voice, user stabilization, polarization diversity and error control coding are also considered and their impact on the transponder design is evaluated. Author

N72-28232*# General Electric Co., Syracuse, N.Y. Electronics Lab.

ELECTRONIC SCENE GENERATOR EXPANSION SYSTEM Final Report

W. H. Sharp Dec. 1971 26 p

(Contract NAS9-11065)

(NASA-CR-115743) Avail: NTIS HC $3.50 CSCL 09E

The design, fabrication, and installation of additions and

modifications to the electronic scene generator located at the NASA Manned Spacecraft Center, Houston, Texas, are described. The equipment delivered was incorporated into the electronic scene generator to enhance its capabilities by providing: (1) additional source computer interfaces; (2) additional edges thereby allowing more detailed scenes; (3) the ability to share edges to effect economies in complex scenes; (4) the ability to use edges without the constraints of a configuration catalog; and (5) the simplified implementation of new environments and environment modifications. Author

N72-28233# Massachusetts Inst. of Tech., Cambridge. Francis Bitter National Magnet Lab.
THE DESIGN, CONSTRUCTION AND OPERATION OF THE MAGNET FOR STABILIZED ARC EXPERIMENTS Final Report, Mar. 1970 - May 1971
M. J. Leupold and R. J. Weggel Wright-Patterson AFB, Ohio ARL Dec. 1971 53 p
(Contract F33615-70-C-1523; AF Proj. 7063)
(AD-739941; ARL-71-0289) Avail: NTIS CSCL 09/1

The report contains information relating to the design, construction, and operation of a cryogenic pulse magnet of 6 inch bore (7 inch winding I.D.), 16 inch winding O.D., and adjustable length up to 26 inches. In its highest field configuration the magnet is capable of generating a peak field of 140 kilogauss when powered by its 5-MW, 12,500-amperes, 400-volt rectifier power supply. Author (GRA)

N72-28234# Corporation for Information Systems Research and Development (CIRAD), Claremont, Calif.
A STUDY OF FUNDAMENTAL FACTORS UNDERLYING SOFTWARE MAINTENANCE PROBLEMS, APPENDICES, VOLUME 2 Final Report, Feb. - Dec. 1971
Bedford, Mass. ESD 20 Dec. 1971 231 p refs
(Contract F19628-71-C-0125)
(AD-739872; ESD-TR-72-121-Vol-2) Avail: NTIS CSCL 09/2

'Problems faced by programmers who must maintain programs someone else wrote' were identified. They were reduced to three fundamental inhibiting factors: (1) the limited rate at which people can make 'relevance tests,' (2) over-confirmation in clues required before hypothesis-testing, and (3) human vulnerability to distraction and procrastination. Studies suggested collectively by these factors were conducted. The studies (1) ascertained that programmers tend to think in terms of conceptual groupings whose objective identification would be helpful, (2) indicated that it was feasible to trace the path the programmer takes as he prepares to make a modification, and (3) identified a few tentative measures of the degree of maintainability of computer programs. Author (GRA)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N72-28235 National Lending Library for Science and Technology, Boston Spa (England).
A NEW PHASE-PLANE METHOD FOR A NONLINEAR CONTROL SYSTEM HAVING TERMS SINUSOIDAL IN THE DISPLACEMENT
G. Miura and K. Sato Mar. 1972 18 p Transl. into ENGLISH from Keisoku Jido Seigyo Gakkai Ronbun-shu (Japan), v. 6, no. 4, 1970 p 346-355
(NLL-RTS-6656) Avail: Natl. Lending Library, Boston Spa, Engl.: £1.80; 6 NLL photocopy coupons

A second order nonlinear control system is studied whose restoring force is a sinusoidal function of the position deviation. The phase plane for such a system is an unbounded cylinder with a displacement of 2 radians as circumference. The equations for an automatic phase-controlled oscillator having a second order filter with delay are considered. The system includes sinusoidal functions in the restoring force and a damping factor which is not phase plane based on conformal representation is used which allows all the limiting curves to be represented in closed form, so Liapunov's second method can be applied. Next, the domain of existence of a limiting curve of the second kind, is found which is very much dependent on each parameter in the damping term. If the system is to converge to a stable singular point, there must be no departure from a bounded domain of initial values. Deduction of this domain is considered. Author

N72-28236 National Lending Library for Science and Technology, Boston Spa (England).
STABILITY CONSIDERATIONS IN TERMS OF SCATTERING PARAMETERS FOR LINEAR ACTIVE TWOPORTS (TRANSISTORS)
E. R. Hauri 30 Mar. 1972 30 p refs Transl. into ENGLISH from Tech. Mitt. PPT (West Germany), v. 49, no. 1, 1971 p 4-11, and no. 2, 1971 p 77-83
(NLL-Trans-2759-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

Considering the condition for oscillation of a twoport with terminations, a general stability condition and a general stability factor in terms of scattering relations are derived. The design of an amplifier with a given power gain for optimum stability is described. The derivations are paralleled by the equivalent in terms of y parameters. Finally it is shown how to proceed in case the absolute value of the parameter Sub 11 (or Sub 22) is greater than or equal to one. Author

N72-28237 National Lending Library for Science and Technology, Boston Spa (England).
CALCULATION OF HIGHER HARMONICS IN ELECTRICAL CIRCUITS WITH STEEL, HAVING ONE NONLINEAR ELEMENT
V. M. Bladyko and V. N. Gobaruk 30 Mar. 1972 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Energ. (Minsk), no. 8, 1971 p 47-51
(NLL-Trans-2846-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The engineering method of calculating higher harmonics in electrical circuits with one nonlinear element is described based on the method of expansion in terms of the small parameter. By means of this method and the iteration method it is relatively simple to calculate nonlinear electrical circuits for any given number of higher harmonics. The suggested method is illustrated by an example calculation of the higher voltage harmonics of a ferroresonance stabilizer. Author

N72-28238 National Lending Library for Science and Technology, Boston Spa (England).
THE REALIZATION OF STABLE ACTIVE RC CIRCUITS HAVING ANY ZERO ROOTS OF TRANSMISSION
J. Petrausch 30 Mar. 1972 11 p refs Transl. into ENGLISH from Nachrichtentechnik (E. Berlin), v. 21, no. 4, Apr. 1971 p 127-130
(NLL-Trans-2799-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The realization of two circuits having arbitrary zeros of transmission is described. A circuit of the second order requires an amplifier with a large open loop gain. Stable transmission poles are obtained by means of frequency dependent feedback. The transmission zero roots are produced by the suitable supply of the input signal to the circuit with feedback. The construction of the active circuit is such that the transmission parameters can be separately adjusted. Author

N72-28239 National Lending Library for Science and Technology, Boston Spa (England).
EXISTENCE AND PROPERTIES OF OPTIMALLY SENSITIVE RLC NETWORKS

B. Huber 30 Mar. 1972 10 p refs Transl. into ENGLISH from Nachrichtentech. Z. (Berlin), v. 24, no. 4, 1971 p 209-212 (NLL-Trans-2793-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The properties of optimally sensitive realizations of some classes of RLC networks are discussed. The nonexistence of a general RLC network, which is optimally sensitive in å finite frequency range, is proved. There are, however, some trivial network functions which can be realized optimally sensitive. Conclusions are drawn, concerning sensitivity optimization techniques. Author

N72-28240* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
METALLIC INTRUSION DETECTOR SYSTEM Patent
Robert D. Lee, inventor (to NASA) Issued 11 Jul. 1972 11 p Filed 18 Aug. 1970 Supersedes N70-41949 (08 - 24, p 4487)
(NASA-Case-ARC-10265-1; US-Patent-3,676,772; US-Patent-Appl-SN-64709; US-Patent-Class-324-41; US-Patent-Class-340-258) Avail: US Patent Office CSCL 09E

A metal detection system is described, with an electromagnetic transmitter with a single transmitting coil and a receiver with a single receiving coil. The receiver generates a signal that may be used to indicate and intrusion into the electromagnetic field of a metallic object, to indicate whether such object is ferrous or nonferrous, and to indicate the relative size of the metallic object. Official Gazette of the U.S. Patent Office

N72-28241* Collins Radio Co., Dallas, Tex.
INFINITE RANGE ELECTRONICS GAIN CONTROL CIRCUIT Patent
Arthur P. Kubicz, inventor (to NASA) Issued 6 Oct. 1970 3 p Filed 4 Nov. 1968 Sponsored by NASA
(NASA-Case-GSC-10786-1; US-Patent-3,533,006; US-Patent-Appl-SN-773072; US-Patent-Class-330-29) Avail: US Patent Office CSCL 09C

A bridge-type gain control circuit with a signal input connection to one of four corners and a ground connection at the opposite corner. Output utilizing circuitry is connected between the two intervening corners. A field effect transistor, as one variable impedance leg of four bridge circuit legs, has a control electrode connection to a control voltage source.
Official Gazette of the U.S. Patent Office

N72-28242*# Massachusetts Inst. of Tech., Cambridge. Research Inst. of Technology.
CIRCUIT MODEL FOR CHARACTERIZING THE NEARLY LINEAR BEHAVIOR OF AVALANCHE DIODES IN AMPLIFIER CIRCUITS Semiannual Status Report, 16 Aug. 1971 - 15 Feb. 1972
Paul Penfield, Jr., Dean F. Peterson, and Donald H. Steinbrecher 15 Feb. 1972 45 p refs
(Grant NGL-22-009-337; Contract DAAB07-71-C-0300)
(NASA-CR-122507) Avail: NTIS HC $4.25 CSCL 09C

A nonlinear circuit model for avalanche diodes is proposed. The model was derived by assuming that the bias dependence of the elements in a known small-signal equivalent-circuit model for existing diodes arises in a manner consistent with the theory of an idealized Read-type device. The model contains a nonlinear R-L branch, a controlled source, and a linear depletion capacitance. The model is used in the nearly linear sense to predict intermodulation distortion and gain compression in avalanche diode amplifiers. Computed results for amplifiers with existing diodes are shown to be in good agreement with experiment.
Author

N72-28243*# Connecticut Univ., Storrs. Dept. of Electrical Engineering.
POLE PLACEMENT WITH CONSTANT GAIN OUTPUT FEEDBACK
B. Sridhar and D. P. Lindorff May 1972 17 p refs
(Grant NGL-07-002-002)
(NASA-CR-127446; TR-72-3) Avail: NTIS HC $3.00 CSCL 09C

Given a linear time invariant multivariable system with m inputs and p outputs, it was shown that p closed loop poles of the system can be preassigned arbitrarily using constant gain output feedback provided (A circumflex, B circumflex) is controllable. These data show that if (A circumflex, B circumflex, C circumflex) is controllable and observable, and Rank B circumflex = m, Rank C circumflex = p, then max (m,p) poles of the system can be assigned arbitarily using constant gain output feedback. Further, it is shown that in some cases more than max (m,p) poles can be arbitrarily assigned. A least square design technique is outlined to approximate the desired pole locations when it is not possible to place all the poles. Author

N72-28244# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
SELF-ADJUSTING LINEARIZING UNITS FOR NONLINEAR SYSTEMS
W. Schneider 1972 33 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-17) Avail: NTIS HC $3.75; DFVLR Porz-Wahn: 10 DM

Linearizing of nonlinear systems, the parameters of which are changed slowly during operation, is considered. In order to linearize such a system, a linearizing unit equipped with a szlf-adjusting circuit is connected at the output side of the nonlinear system. If the parameters of the nonlinear system change, the linearizing unit continously adjusts itself. Self-adjusting linearizing units for second and third order systems are developed and investigated. Author

N72-28245# Toulouse Univ. (France).
STUDY OF GENERATORS USING A POLYPHASE RECTIFIER AND DYNAMIC FILTER FOR COMMAND SYSTEMS Ph.D. Thesis [ETUDE DES GENERATEURS UTILISANT UN REDRESSEUR POLYPHASE ET UN FILTRE DYNAMIQUE EN TANT QUE SYSTEMES DE COMMANDE]
Roland Prajoux 14 Dec. 1971 247 p refs In FRENCH
Avail: NTIS HC $14.50

Generalities are presented on continuous generators utilizing a polyphase rectifier and a passive or dynamic filter. A study was made of the local behavior of a command loop comprised of a polyphase rectifier. The loop's strong signal behavior was also studied for systems of the first and second order. A synthetic approach to polyphase rectifier command systems is also discussed. Transl. by K.P.D.

N72-28246*# Texas Instruments, Inc., Dallas.
DEVELOPMENT OF BEAM LEADED LOW POWER LOGIC CIRCUITS Final Report
Bill Wiley Smith and Farris Malone Mar. 1972 63 p ref
(Contract NAS1-10532)
(NASA-CR-112099; Rept-03-72-27) Avail: NTIS HC $5.25 CSCL 09C

The technologies of low power TTL and beam lead processing were merged into a single product family. This family offers the power and thermal advantages of low power(54L), while providing the additional reliability advantages of beam leads. The reduction in the power and heat levels also allows the system designer to take advantage, through beam lead, multichip assemblies, of increased package density to reduce system size and weight. Author

N72-28247# Technische Hochschule Hannover (West Germany). Fakultaet fuer Maschinenwesen.
A CONTRIBUTION TO THE OPTIMUM DESIGN OF ELECTRICAL MACHINES WITH NONLINEAR COMPUTER PROGRAMMING Ph.D. Thesis [EIN BEITRAG ZUR ENTWURFSOPTIMIERUNG ELEKTRISCHER MASCHINEN MIT DER NICHTLINEAREN PROGRAMMIERUNG]

Klaus Heuck 1971 127 p refs In GERMAN
Avail: NTIS HC $8.50

Nonlinear programming methods for the computerized design optimization of electrical machines are reported. Basic optimization problems for an asynchronic motor are presented in an example calculation which is also adaptable to some other technical design calculations. Transl. by G.G.

N72-28248# Technische Hochschule, Darmstadt (West Germany). Facultat fuer Elektrotechnik.
ON THE SYNTHESIS OF TIME OPTIMAL AND TIME SUBOPTIMAL REGULATION OF SYSTEMS WITH RELAY CONTROLLED, MOTORIZED FINAL CONTROL ELEMENTS Ph.D. Thesis [ZUR SYNTHESE ZEITOPTIMALER UND ZEITSUBOPTIMALER REGELUNGEN BEI SYSTEMEN MIT RELAISGESCHALTETEN MOTORISCHEN STELLGLIEDERN]
Ladislaus Borsi 16 Dec. 1971 136 p refs In GERMAN
(Diss-17) Avail: NTIS HC $9.00

The design and development of time optimal and time suboptimal controls using motorized final control elements are discussed. Three point regulation and feedback networks for systems control are examined. Two point regulation with nonlinear and linear feedback as an approximation of time optimal control are described. Examples of the characteristics of approximate time optimal regulation are included. The development of an algorithm for numerical analysis of the problem is presented. Transl. by P.N.F.

N72-28249# Technische Hochschule Darmstadt (West Germany).
SYNTHESIS OF EQUIVALENT RLC BRIDGES WITH BI-QUADRATIC IMPEDANCE FUNCTION AND ITS TRANSFORMATION EQUATIONS IN SERIES-PARALLEL DIPOLES Ph.D. Thesis [SYNTHESE AEQUIVALENTER RLC BRUECKEN ZWEIPOLE MIT BIQUADRATISCHER IMPEDANZFUNKTION UND IHRE UMRECHNUNGSBEZIEHUNGEN IN SERIEN-PARALLEL-ZWEIPOLE]
Gonde Dittmer 8 Jul. 1971 120 p refs In GERMAN
Avail: NTIS HC $8.00

The theory and analysis of linear network circuits are presented. The numerical solution of equivalent RLC circuits is described. The electrical properties of series-parallel networks are examined. Mathematical models are included to support the theoretical discourse. Diagrams of typical network circuits are illustrated and graphs of the circuit properties for various conditions are developed. Transl. by P.N.F.

N72-28250# Technische Hochschule Darmstadt (West Germany). Facultat fuer Elektrotechnik.
TOPOLOGICAL SYNTHESIS AND ANALYSIS OF SYMMETRICAL COUPLING-FREE AND GROUNDED REACTANCE ALL-PASSES, ESPECIALLY OF THE SECOND AND FOURTH ORDER Ph.D. Thesis [TOPOLOGISCHE SYNTHESE UND ANALYSE SYMMETRISCHER KOPPLUNGSFREIER UND ERDGEBUNDENER REAKTANZALLPASSE, INSBESONDERE DER ZWEITEN UND VIERTEN ORDNUNG]
Tilman Motz 8 Jul. 1971 165 p refs In GERMAN
Avail: NTIS HC $10.25

The theory and numerical analysis of equivalent electrical networks are discussed. The application of topological synthesis and algebraic solutions to network theory are examined. Mathematical models are developed to explain the interrelationships of the network components. Various classes of networks and their distinctive properties are analyzed. The various types of electrical networks are illustrated by block diagrams. Graphs of the electrical properties of networks are included. Transl. by P.N.F.

N72-28251# Technische Hochschule, Darmstadt (West Germany).
AN ELECTRONIC DELAY AND COMPRESSION METHOD FOR FREQUENCY AND TIME LIMITED ANALOG SIGNALS Ph.D. Thesis [EIN VERFAHREN ZUR ELEKTRONISCHEN DEHNUNG UND STAUCHUNG FREQUENZ- UND ZEITBEGRENZTER ANALOGSIGNALE]
Willi Rychetsky 26 Feb. 1971 29 p refs In GERMAN
Avail: NTIS HC $3.50

Time linear delay and compression of a time limited analog signal by controlled velocity modulation produces a delay effect if maximal signal duration decreases linearly from the beginning of a time period. The time delay system consists mainly of the primary delay circuit with linear frequency dependent phase velocity that is converted by subcarrier signal modulation with time linear frequency changes. It is calculated that the system undergoes noise-free time modulation if a second time period circuit pre-demodulates subcarrier amplitude spectrum.
Transl. by G.G.

N72-28252*# Texas Univ., Austin. Dept. of Mechanical Engineering.
UTILIZATION OF A CRT DISPLAY LIGHT PEN IN THE DESIGN OF FEEDBACK CONTROL SYSTEMS Final Report
J. Garth Thompson and Kenneth R. Young May 1972 125 p
(Contract NAS9-7926)
(NASA-CR-115741) Avail: NTIS HC $8.25 CSCL 09C

A hierarchical structure of the interlinked programs was developed to provide a flexible computer-aided design tool. A graphical input technique and a data structure are considered which provide the capability of entering the control system model description into the computer in block diagram form. An information storage and retrieval system was developed to keep track of the system description, and analysis and simulation results, and to provide them to the correct routines for further manipulation or display. Error analysis and diagnostic capabilities are discussed, and a technique was developed to reduce a transfer function to a set of nested integrals suitable for digital simulation. A general, automated block diagram reduction procedure was set up to prepare the system description for the analysis routines. Author

N72-28253# Stanford Research Inst., Menlo Park, Calif.
MICROWAVE ACTIVE NETWORK SYNTHESIS Final Report, 13 Oct. 1969 - 27 Dec. 1971
Edward G. Cristal, Allen F. Podell, and Seymour B. Cohn Feb. 1972 109 p refs
(Contract DAAB07-70-C-0044; SRI Proj. 8245)
(AD-739607; Ecom-0044-F) Avail: NTIS CSCL 09/5

The report describes the application of meander lines to impedance transformers, and discusses two types of negative-impedance circuits and two slot-line topics. It is demonstrated that meander lines constitute a class of impedance transformers of which stepped-impedance transformers are a special case. Two types of negative-impedance-converter (NIC) circuits were designed and constructed: (1) a high-power NUNIC, and (2) a FET-NIC filter. A high-power NUNIC circuit intended for operation at 200 to 500 MHz was built and produced negative resistance from below 80 MHz to above 680 MHz. A lossless one-pole filter incorporating the NUNIC was built for operation at 230 MHz and exhibited a 3-dB filter bandwidth of 2.7 MHz.
Author (GRA)

N72-28254# Iowa Univ., Iowa City. Dept. of Mathematics.
TESTABILITY OF QUASI PRIME IMPLICANT NETWORKS
Benjamin M. Lin and John P. Robinson Mar. 1972 22 p refs
(Contract N00014-68-A-0500)
(AD-740088; TR-52) Avail: NTIS CSCL 09/2

A multilevel quasi prime implicant network is defined for switching functions. This realization requires a reduced number of detection tests for stuck-at-faults and a reduced hardware cost, as compared with a two-level AND-OR realization. The locatability of stuck-at-faults is improved in a quasi prime implicant network realization. Author (GRA)

N72-28255# Cornell Univ., Ithaca, N.Y.
CIRCUIT PROPERTIES OF DISPERSIVE COUPLED TRANSMISSION LINES AND WAVEGUIDES Ph.D. Thesis
David F. Noble and Herbert J. Carlin Griffiss AFB, N. Y. RADC Jan. 1972 326 p refs
(Contract F30602-68-C-0075; Grant NSF GK-2147)
(AD-739894; RADC-TR-71-320) Avail: NTIS CSCL 09/1

The frequency domain behavior of lossless, uniform, dispersive coupled transmission line systems and of lossless waveguides uniform in the direction of propagation but not necessarily in the transverse direction are investigated. Some frequency domain properties of the propagation constants of such systems implied by losslessness and uniformity are explored, and ways of approximating waveguide propagation constants are developed.
Author (GRA)

N72-28256# North Carolina State Univ., Raleigh. Dept. of Electrical Engineering.
A SPEECH ENCODER-MULTIPLEXER FEASIBILITY STUDY Final Report, 1 Aug. 1970 - 29 Feb. 1972
J. B. Neal and R. W. Stroh 8 Mar. 1972 121 p
(Contract F44620-70-C-0122; AF Proj. 9769)
(AD-739965; AFOSR-72-0735TR) Avail: NTIS CSCL 09/4

The report contains a detailed study of various voice differential PCM systems applicable for digitally encoding 3, 4, 5 and 6 voice channels into a 153.6 kilobit per second digital signal which can be used in a switched telecommunication network. Transmission of both speech and data signals over these voice channels is considered. Included in the report are: Calculations of the performance of differential PCM systems with various data signals; An analysis of the performance of differential PCM systems with speech signals; A description of a differential PCM system constructed using standard T1 technology. The research reported here consists of theoretical studies, computer simulation, subjective testing and hardware construction.
Author (GRA)

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N72-28257*# Michigan Univ., Ann Arbor. Willow Run Labs.
MAINTENANCE AND OPERATION OF THE MULTISPECTRAL DATA COLLECTION AND REPRODUCTION FACILITIES OF THE WILLOW RUN LABORATORIES Interim Report, Jan. 1970 - Jun. 1971
Philip G. Hasell, Jr. and Stephen R. Stewart Jun. 1972 32 p refs
(Contract NAS9-9304)
(NASA-CR-115710; WRL-25990-37-P) Avail: NTIS HC $3.75 CSCL 14B

The accomplishments in multispectral mapping during 1970 and (fiscal year) 1971 are presented. The mapping was done with the instrumented C-47 aircraft owned and operated by Willow Run Laboratories of The University of Michigan. Specific information for flight operations sponsored by NASA/MSC (Manned Spacecraft Center) in 1970 and fiscal year 1971 is presented, and a total listing of flights for 1968, 1969, 1970, and fiscal year 1971 is included in the appendices. The data-collection and reproduction facilities are described. Author

N72-28258# Smith (Wilbur) and Associates, San Francisco, Calif.
AIRPORT ACCESS
Jun. 1970 150 p refs Sponsored in part by HUD Prepared for Bay Area Study of Aviation Requirements and the Assoc. of Bay Area Govt.
Avail: NTIS HC $9.50

The significant findings regarding the San Francisco, California airport ground travel studies are presented. The methodology developed to test and evaluate the inter-relationships of ground transportation facilities with airport location, size, and service levels is described. The primary objective of the access portion of the study is to measure the ability of existing and planned ground and air transportation systems to serve passenger, cargo, mail, employee, vendor and rental car, airport access, and parking demands through 1985. Author

N72-28259*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EVALUATION OF A SELF-ASPIRATING LOCAL TOTAL ENTHALPY PROBE IN A LOW-DENSITY ARC-HEATED HYPERSONIC WIND TUNNEL
Robert W. Guy and Andronicos G. Kantsios Washington Aug. 1972 23 p refs
(NASA-TM-X-2591; L-8248) Avail: NTIS HC $3.00 CSCL 14B

A shock-swallowing, self-aspirating, local total enthalpy probe has been evaluated in a low density nonequilibrium, hypervelocity airstream. The probe, which incorporated an air gap to separate the internal and external cooling passages, was tested in an electric archeated wind tunnel at an average Mach number of 11.7 and an average Reynolds number per meter of 57,000. The free stream enthalpy probe data are compared with bulk calorimeter measurements of total enthalpy at the beginning of the gas expansion and with local total enthalpy inferred from a theoretical nonequilibrium gas expansion model by using free stream velocity measurements obtained from a mass flow probe. The three techniques are in relative agreement at the lower enthalpies. However, at the higher enthalpies, the enthalpy probe data lie considerably below the other data. This low data may be caused by the chemical and vibrational energy frozen in the flow not being sensed by the probe. Other problems associated with the shock-swallowing total enthalpy probe are discussed, and recommendations for improving the probe performance are presented. Author

N72-28260# Weapons Research Establishment, Salisbury (Australia).
THE DEVELOPMENT OF A GAS GUN TO STUDY THE SUBSONIC FLIGHT OF PROJECTILES
R. E. Dudley Apr. 1972 20 p refs
(WRE-TN-639(WR&D)) Avail: NTIS HC $3.00

The construction of a compressed gas launcher or gas gun, primarily designed for the launching of projectiles, is described and details of its performance are given. A quick acting mechanical valve was used to release the high pressure gas instead of the more usual method of rupturing a thin diaphragm. More than 3000 firings have been made and firing rates of up to 30 firings per hour have been achieved. Muzzle velocities to 1000 ft/s with a 1 lb projectile have been measured and the heaviest weight launched has been 57 lb. Author

N72-28261# Oak Ridge National Lab., Tenn.
FAST FREQUENCY-TUNING OF SUPERCONDUCTING RESONANT RF CAVITIES FOR HEAVY ION LINEAR ACCELERATORS
Peyton Z. Peebles, Jr. 15 Feb. 1972 35 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3654) Avail: NTIS

Superconducting resonant radio frequency (RF) cavities which utilize helices for producing slow wave velocities are prime candidates for creating the large accelerating electric fields needed in linear heavy ion accelerators. Because such structures are subject to mechanical vibrations, these vibrations may cause fast shifts in the cavity resonant frequency. The result of such shifts is to cause undesirable phase modulation of the accelerating

field. Results of a study of an all-electronic method of fast tuning of the cavity to compensate for the vibration are described. Two types of control are discussed. The first employs only two electrical entrance points (ports) to the cavity. It is mechanically simpler than the second type, which uses three ports, but suffers some undesirable features not present in the three-port method.
Author (NSA)

N72-28262# General Electric Co., Daytona Beach, Fla.
STUDY TO DEFINE THE INTERFACE AND OPTIONS FOR THE ADVANCED SIMULATION IN UNDERGRADUATE PILOT TRAINING VISUAL SIMULATOR Final Technical Report, Dec. 1970 - May 1971
Joseph A. Juhlin Sep. 1971 152 p refs
(Contract F33615-71-C-1211; AF Proj. 686F)
(AD-739585; Rept-71DBF017(E); AFHRL-TR-71-47) Avail: NTIS CSCL 01/3

In a study to define the interface and options for the ASUPT visual simulator, four major areas were investigated. These specific areas are: CRT electronics definition, CRT electrical characteristics, Display multiplexing, and Edge smoothing.
Author (GRA)

N72-28263# Naval Air Engineering Center, Philadelphia, Pa. Ground Support Equipment Dept.
CRYOGENIC CLEANLINESS AND SAFETY Progress Report, Sep. 1971 - Feb. 1972
Thomas Dale Weikel Feb. 1972 20 p refs
(AD-740097; NAEC-GSED-51; PR-1) Avail: NTIS CSCL 15/5

The report describes methods seeking to enhance three main areas of cryogenic safety; the reduction of liquid and gas contamination thru correct design and procedures, an improvement in cleaning of systems to eliminate mechanically introduced contaminants, and the conversion of conventional cryogenic shops into safety-oriented working areas. Author (GRA)

N72-28264# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
EVALUATION OF KAISER XM19 WATERPROOF ALUMINUM HONEYCOMB LANDING MAT WITH D AND D1 CONNECTORS Final Report, May 1968 - Jun. 1969
Gordon L. Carr Feb. 1972 96 p refs
(DA Proj. 1G6-64717-D-556)
(AD-738840; AEWES-Misc-Paper-S-72-4) Avail: NTIS CSCL 01/5

The investigation was conducted to evaluate a waterproof version of XM19 landing mat. Laboratory, blast, and traffic tests were conducted on three versions of the XM19 waterproof mat. The traffic tests were conducted using a 25,000-lb F-4C single-wheel load with a tire inflation pressure of 250 psi. The tests were conducted both inside a hangar for protection from the elements and in an exposed area in which the tests were conducted over a six-month period with the mat subjected to both natural and simulated rainfall. Author (GRA)

N72-28265# Naval Civil Engineering Lab., Port Hueneme, Calif.
AIRFIELD PAVEMENT CONDITION SURVEY, USNALF CROWS LANDING, CALIFORNIA
H. Tomita and L. J. Woloszynski Feb. 1972 56 p ref
(AD-739316; NCEL-TN-1219) Avail: NTIS CSCL 01/5

The results of a condition survey of the airfield pavements at the USNALF Crows Landing, California are presented. The survey established statistically-based condition numbers (weighted defect densities) which were direct indicators of the condition of the individual portland cement concrete pavement facilities.
Author (GRA)

N72-28266# Naval Civil Engineering Lab., Port Hueneme, Calif.
AIRFIELD PAVEMENT CONDITION SURVEY, USMCAS YUMA, ARIZONA
H. Tomita and L. J. Woloszynski Feb. 1972 16 p ref
(AD-739317; NCEL-TN-1218) Avail: NTIS CSCL 01/5

The results of a condition survey of the airfield pavements at the USMCAS Yuma, Arizona are presented. The survey established statistically-based condition numbers (weighted defect densities) which were direct indicators of the condition of the individual asphaltic concrete and portland cement concrete pavement facilities. Additional evaluation efforts included photographic coverage of defect types, preparation of the construction history of the station, compilation of data on current aircraft traffic and aircraft types using the station, performance of runway skid resistance tests, and a study of the requirements for future pavement evaluation efforts. Author (GRA)

N72-28267# Naval Civil Engineering Lab., Port Hueneme, Calif.
AIRFIELD PAVEMENT CONDITION SURVEY, USMCAS (H) SANTA ANA AND USMCAS (HOLF) MILE SQUARE, CALIFORNIA
H. Tomita and J. A. Garcia Jan. 1972 84 p refs
(AD-738828; NCEL-TN-1215) Avail: NTIS CSCL 01/5

The results of a condition survey of the airfield pavements at the U. S. Marine Corps Air Station (Helicopter), Santa Ana and U. S. Marine Corps Air Station (Helicopter Outlying Landing Field), Mile Square, California are presented. The surveys established statistically-based condition numbers (weighted defect densities) which were direct indicators of the condition of the individual asphaltic concrete and portland cement concrete pavement facilities. Author (GRA)

N72-28268# Naval Civil Engineering Lab., Port Hueneme, Calif.
AIRFIELD PAVEMENT CONDITION SURVEY, USNALF SAN CLEMENTE ISLAND, CALIFORNIA
H. Tomita and L. J. Woloszynski Jan. 1972 39 p ref
(AD-738827; NCEL-TN-1214) Avail: NTIS CSCL 01/5

The results of a condition survey of the airfield pavements at the U. S. Naval Auxiliary Landing Field, San Clemente Island, California are presented. The survey established statistically-based indicators of the condition of the individual portland cement concrete pavement facilities. Additional evaluation efforts included photographic coverage of defect types, preparation of the construction history of the station, compilation of data on current aircraft traffic and aircraft types using the station, performance of runway skid resistance tests, and a study of the requirements for future pavement evaluation efforts. Author (GRA)

N72-28269# Naval Civil Engineering Lab., Port Hueneme, Calif.
AIRFIELD PAVEMENT CONDITION SURVEY, USNOLF SAN NICOLAS ISLAND, CALIFORNIA
H. Tomita and R. B. Brownie Dec. 1971 53 p ref
(AD-738824; NCEL-TN-1208) Avail: NTIS CSCL 01/5

The results of a condition survey of the airfield pavements at the U.S. Naval Outlying Field, San Nicolas Island, California are presented. The survey established statistically-based condition numbers (weighted defect densities) which were direct indicators of the condition of the individual asphaltic concrete and portland cement concrete pavement facilities. Additional evaluation efforts included photographic coverage of defect types, preparation of the construction history of the station, compilation of data on current aircraft traffic and aircraft types using the station, and a study of the requirements for future pavement evaluation efforts.
Author (GRA)

N72-28270# Naval Civil Engineering Lab., Port Hueneme, Calif.
AIRFIELD PAVEMENT CONDITION SURVEY, USNALF MONTEREY, CALIFORNIA
H. Tomita and L. J. Woloszynski Jan. 1972 88 p
(AD-739314; NCEL-TN-1217) Avail: NTIS CSCL 01/5

The results of a condition survey of the airfield pavements at the USNALF Monterey, California are presented. The survey established statistically-based condition numbers (weighted defect densities) which were direct indicators of the condition of the individual asphaltic concrete and portland cement concrete pavement facilities. Additional evaluation efforts included

photographic coverage of defect types, preparation of the construction history of the station, compilation of data on current aircraft traffic and aircraft types using the station, performance of runway skid resistance tests, and a study of the requirements for future pavement evaluation efforts. Author (GRA)

N72-28271# Franklin Inst., Philadelphia, Pa.
SNOW STABILIZATION TECHNIQUES FOR HELICOPTER LANDINGS Final Report
Francis W. Cooke and William H. Collins Sep. 1971 56 p refs (Contract DAAD05-70-C-0389)
(AD-738561; FIRL-C2885-06; LWL-CR-05C71) Avail: NTIS CSCL 01/5

The report describes the result of a feasibility study to investigate surface stabilization of snow by chemical treatment to eliminate reduced visibility created by helicopter down wash on landing and take-off. Of the candidate methods evaluated, sintering of the snow by methanol appeared promising. GRA

N72-28272# Naval Air Engineering Center, Philadelphia, Pa. Engineering Dept. (SI)
DESIGN OPTIMIZATION AND PERFORMANCE PREDICTION OF A SHOREBASED AIRCRAFT RECOVERY SYSTEM BY MATHEMATICAL MODEL COMPUTER SIMULATION. PROPOSED SYSTEM NO. 1, CAPSTAN CABLE SYSTEM
Robert T. Barron 24 Mar. 1972 72 p refs
(AD-740098; NAEC-ENG-7740) Avail: NTIS CSCL 01/5

The design and performance predictions of the first of several proposed high cycle expeditionary shorebased aircraft recovery systems are presented. The system was obtained by means of mathematical model computer simulation. This system consists of a steel wire rope purchase cable, a stationary low inertia cable storage system, and a constant radius multi-wrap capstan attached to an energy absorber. The results show that this system is capable of satisying design requirements. Author

N72-28273# Naval Air Engineering Center, Philadelphia, Pa. Engineering Dept. (SI)
PROCEDURE FOR CERTIFICATION TESTS OF TYPE C MARK 13 MOD 1 CATAPULTS, FLUSH DECK NOSE GEAR LAUNCH EQUIPMENT, BRIDLE ARRESTERS, AND JET BLAST DEFLECTORS ON USS NIMITZ, CVAN-68
W. Riedel Mar. 1972 96 p refs
(AD-738445; NAEC-ENG-7430) Avail: NTIS CSCL 01/5

The report contains the procedure for shipboard tests of Type C13 Mod 1 catapults and all associated launcher equipment on USS Nimitz CVAN-68. Included are safety precautions, visual checks, static proof loads, hydrostatic tests, signal system tests, functional tests, wet accumulator charging and blowdown tests, establishment of water level, instrumentation requirements and deadload calibration. Author (GRA)

N72-28274# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
EVALUATION OF MO-MAT 158 AS LIGHT-DUTY LANDING MAT Final Report, Jan. - May 1970
Carroll J. Smith Feb. 1972 78 p refs
(DA Proj. 1G6-64717-DH-01)
(AD-738137; AEWES-Misc-Paper-S-72-5) Avail: NTIS CSCL 01/5

The investigation was conducted to evaluate MO-MAT, a reinforced plastic material molded into a waffle-like configuration, for use as light-duty landing mat. Tests were conducted on four special panels of MO-MAT 158 connected by nut plates with bolts placed in predrilled holes. The traffic tests were conducted using C-130 aircraft loading on three prepared subgrades of different strengths. Results of this investigation indicated that MO-MAT 158 will sustain 96, 184, and 500 actual coverages of traffic when placed on subgrades with rated CBR's of 4.0, 6.5, and 10, respectively. Author (GRA)

N72-28947* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
ANALYSIS OF MORGANTOWN VEHICLE STEERING CONTROL
H. S. Lin and E. L. Marsh *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 58-71 ref (For availability see N72-28941 19-34)
CSCL 13F

N72-28275 National Lending Library for Science and Technology, Boston Spa (England).
MEASUREMENT OF FLUID AND GAS FLOW BY MEANS OF ORIFICE PLATES IN CLOSED CIRCUITS
24 Aug. 1971 71 p Transl. into ENGLISH of Neth. Std. NEN-3005, May 1967
(NLL-M-20984-(5828.4F); NEN-3005) Avail: Natl. Lending Library, Boston Spa, Engl.: 7 NLL photocopy coupons

A standard for determining fluid flow rate by orifice flow is presented. Topics discussed include principles of measurement; requirements of flow medium, arrangement, and installation; formulas for determining diameter ratio of orifice plate; and errors. F.O.S.

N72-28276 National Lending Library for Science and Technology, Boston Spa (England).
FLOW MEASUREMENT WITH STANDARDIZED NOZZLES, ORIFICE PLATES AND VENTURI TUBES
Dec. 1971 51 p refs Transl. into ENGLISH of German Std. DIN-1952 dated Aug. 1971
(NLL-M-22287-(5828.4F); DIN-1952) Avail: Natl. Lending Library, Boston Spa, Engl.: 4 NLL photocopy coupons

Standards for throttling devices (nozzles, orifice plates and Venturi tubes) used for measuring fluid flow in pipes are presented. The requirements including conditions of flow, tolerances, bore, and installation for each type device are discussed. F.O.S.

N72-28277# Sydney Univ. (Australia). Dept. of Aeronautical Engineering.
EXPLORATORY MEASUREMENTS OF THE FLOW IN THE WING-TIP VORTICES OF A LOCKHEED HERCULES
E. D. Poppleton Dec. 1971 29 p refs Sponsored by Dept. of Civil Aviation Original contains color illustrations
(ATN-7104) Avail: NTIS HC $3.50

The flow in a trailing vortex was visualized by means of smoke from a ground-based generator, and some measurements were made of the velocity perturbation at a fixed point as the vortex was convected past the anemometer. The accuracy of the measurements was not high, but they were consistent with values calculated from Owen's formula. There was some evidence that the slipstream from the propellers was affecting the flow in the core of the vortex. Author

N72-28278*# Stanford Univ., Calif. Dept. of Mechanical Engineering.
NONEQUILIBRIUM SHOCK WAVE STRUCTURE. 1. KINETICS OF NITRIC OXIDE FORMATION AND DECOMPOSITION, 2 Semiannual Progress Report, 1 Nov. 1971 - 1 Jun. 1972
C. H. Kruger and R. K. Hanson 1 Jun. 1972 12 p ref
(Grant NGR-05-020-583)
(NASA-CR-127691) Avail: NTIS HC $3.00 CSCL 20D

Theoretical and numerical aspects of molecular flow simulation focussed on the development of collision models for diatomic and triatomic gases undergoing rotational excitation and energy exchange. A laser absorption technique is proposed and analyzed as sufficiently sensitive for measuring rotational populations in a nonequilibrium shock wave. Also reported is a survey of available literature on NO chemical rate data in preparation for experiments on NO decompensation kinetics in atmospheric pollution. G.G.

N72-28279*# General Dynamics/Convair, San Diego, Calif. Aerospace Div.

AN ANALYTICAL STUDY OF REDUCED-GRAVITY LIQUID REORIENTATION USING A SIMPLIFIED MARKER AND CELL TECHNIQUE

W. S. Betts, Jr. Aug. 1972 73 p refs

(Contract NAS3-14361)

(NASA-CR-120944; GDCA-DDB72-003) Avail: NTIS HC $5.75 CSCL 20D

A computer program called HOPI was developed to predict reorientation flow dynamics, wherein liquids move from one end of a closed, partially filled, rigid container to the other end under the influence of container acceleration. The program uses the simplified marker and cell numerical technique and, using explicit finite-differencing, solves the Navier-Stokes equations for an incompressible viscous fluid. The effects of turbulence are also simulated in the program. HOPI can consider curved as well as straight walled boundaries. Both free-surface and confined flows can be calculated. The program was used to simulate five liquid reorientation cases. Three of these cases simulated actual NASA LeRC drop tower test conditions while two cases simulated full-scale Centaur tank conditions. It was concluded that while HOPI can be used to analytically determine the fluid motion in a typical settling problem, there is a current need to optimize HOPI. This includes both reducing the computer usage time and also reducing the core storage required for a given size problem. Author

N72-28280# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Freiburg (West Germany). Inst. fuer Angewandte Mathematik und Mechanik.

STEADY LAMINAR HYPERSONIC BOUNDARY LAYERS PAST AN AXISYMMETRIC HYPERBOLOID AT THERMO-CHEMICAL EQUILIBRIUM

Dieter Straub, Willi Schoenauer, Alfred Schaber, Sui Lin, and Ernst Adams 1972 106 p refs In GERMAN; ENGLISH summary

(DLR-FB-72-16) Avail: NTIS HC $7.50; DFVLR Porz-Wahn: 25.50 DM

For laminar hypersonic flow, the hydrodynamic equations of balance are discussed for multicomponent mixtures of chemically reacting ideal gases. The pertinent differential equations are derived for stationary boundary layer flows past catalytic surfaces of planar or axisymmetric bodies. For the calculation of the constitutive properties of dissociated air, a model with the five components N2, O2, NO, N, and O is employed. By use of simple analytic relations, the pertinent reaction data, the necessary thermal properties, and the transport coefficients are determined with sufficient accuracy for this model. The boundary layer equations are solved numerically for selected conditions of flight of an axisymmetric hyperboloid under the assumption of thermochemical equilibrium. Author

N72-28281# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Aerodynamik.

SIMPLIFICATION OF CALCULATIONS AT THE OBLIQUE COMPRESSION SHOCK

J. Wellmann 1972 28 p refs In GERMAN; ENGLISH summary

(DLR-FB-72-11) Avail: NTIS HC $3.50; DFVLR Porz-Wahn: 9 DM

In order to simplify the calculation of oblique compression shocks, two auxiliary angles are brought in analogously to the Mach angle. All shock relations are then exclusively expressed by the different angle parameters. The resulting expressions are of great simplicity and symmetry, formally very similar to the law of refraction of the optical system. The explicit solution of the shock at the wedge can very easily be expressed. The Prandtl-Meyer expansion also simplifies essentially, so that the calculation of some shock reflection problems can be done by means of a trigonometrical table. Author

N72-28282# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Luftstrahlantriebe.

DATA REDUCTION METHODS FOR TWO DIMENSIONAL CASCADE MEASUREMENTS

H. Starken and P. Schimming 1972 77 p refs In GERMAN; ENGLISH summary

(DLR-Mitt-72-03) Avail: NTIS HC $5.75; DFVLR Porz-Wahn: 20.90 DM

Different methods for reduction of two-dimensional cascade data are presented, getting characteristic parameter and flow properties. Especially diverse possibilities of averaging the wake values are described. Finally a flow diagram is shown, which contains all the equations of the above declared methods. Author

N72-28283# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.

SPACE CORRELATIONS OF THE FLUCTUATING PRESSURE IN SUBSONIC TURBULENT JETS

Helmut V. Fuchs 1972 50 p refs

(DLR-FB-72-07) Avail: NTIS HC $4.50; DFVLR Porz-Wahn: 15 DM

The turbulence structure of a circular air jet is studied by correlating both full- and narrow-band signals from locally displaced microphone probes. A high degree of statistical interdependence is found for the pressure in planes normal to the axis, in particular, for frequency components at St = 0.5, where the bulk of the fluctuating near field energy is concentrated. The axisymmetric content of the turbulence travels downstream in an almost deterministic wave-like manner. With the turbulence being everything but isotropic, some of the assumptions common in jet noise theory are re-examined and an alternative model suggested. The continuing work was stimulated by and may contribute the controversy about the degree of order in jet turbulence. Author

N72-28284# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.

ON MULTIPLE AND UPSTREAM RUNNING WAVES IN FREE JETS

Dietrich Bechert 1972 65 p refs In GERMAN; ENGLISH summary

(DLR-FB-72-06) Avail: NTIS HC $5.25; DFVLR Porz-Wahn: 26.10 DM

The stability of plane and circular free jets was investigated. The investigations were limited to the frictionless incompressible stability problem with spatially growing waves. In order to treat the problem analytically, simple models for the boundary layer were used. The evaluation of the calculations showed the existence of a variety of additional wave modes besides those which are already known. These additional modes have strong phase shifts of the alternating pressure and velocity in a cross-section perpendicular to the flow direction. Therefore it is argued that the existence of these--not yet measured--additional modes depends sensitivity on the boundary layer profile and on additional boundary conditions, i. e. the boundary of the nozzle. The influence of the boundary-layer profile was investigated using simplified calculations, which show that the number of additional modes becomes smaller with increasing boundary layer thickness. Author

N72-28285*# California Univ., Davis. Dept. of Mechanical Engineering.
A COMPUTER PROGRAM FOR THE CALCULATION OF LAMINAR AND TURBULENT BOUNDARY LAYER FLOWS
H. A. Dwyer, E. D. Doss, and A. L. Goldman [1972] 76 p refs (Contract NAS2-6362)
(NASA-CR-114366) Avail: NTIS HC $6.00 CSCL 20D*

The results are presented of a study to produce a computer program to calculate laminar and turbulent boundary layer flows. The program is capable of calculating the following types of flow: (1) incompressible or compressible, (2) two dimensional or axisymmetric, and (3) flows with significant transverse curvature. Also, the program can handle a large variety of boundary conditions, such as blowing or suction, arbitrary temperature distributions and arbitrary wall heat fluxes. The program has been specialized to the calculation of equilibrium air flows and all of the thermodynamic and transport properties used are for air. For the turbulent transport properties, the eddy viscosity approach has been used. Although the eddy viscosity models are semi-empirical, the model employed in the program has corrections for pressure gradients, suction and blowing and compressibility. The basic method of approach is to put the equations of motion into a finite difference form and then solve them by use of a digital computer. The program is written in FORTRAN 4 and requires small amounts of computer time on most scientific machines. For example, most laminar flows can be calculated in less than one minute of machine time, while turbulent flows usually require three or four minutes. Author

N72-28286*# California Univ., Santa Barbara.
VORTEX EQUATIONS: SINGULARITIES, NUMERICAL SOLUTION, AND AXISYMMETRIC VORTEX BREAKDOWN
Hartmut H. Bossel Washington NASA Jul. 1972 74 p refs (Grant NGR-05-010-025)
(NASA-CR-2090) Avail: NTIS HC $3.00 CSCL 20D

A method of weighted residuals for the computation of rotationally symmetric quasi-cylindrical viscous incompressible vortex flow is presented and used to compute a wide variety of vortex flows. The method approximates the axial velocity and circulation profiles by series of exponentials having (N + 1) and N free parameters, respectively. Formal integration results in a set of (2N + 1) ordinary differential equations for the free parameters. The governing equations are shown to have an infinite number of discrete singularities corresponding to critical values of the swirl parameters. The computations point to the controlling influence of the inner core flow on vortex behavior. They also confirm the existence of two particular critical swirl parameter values: one separates vortex flow which decays smoothly from vortex flow which eventually breaks down, and the second is the first singularity of the quasi-cylindrical system, at which point physical vortex breakdown is thought to occur. Author

N72-28287*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INSTALLATION CAUSED FLOW DISTORTION AND ITS EFFECT ON NOISE FROM A FAN DESIGNED FOR TURBOFAN ENGINES
Frederick P. Povinelli and James H. Dittmar 1972 21 p refs Proposed for presentation at 7th Aerodyn. Testing Conf., Palo Alto, Calif., 13-15 Sep. 1972; sponsored by AIAA
(NASA-TM-X-68105; E-7043) Avail: NTIS HC $3.25 CSCL 20D

A ground test stand was used to obtain acoustic data on a full scale prototype fan designed for quiet subsonic aircraft engines. The fan was installed in three different ways in the test stand. In two of the installations the fan was driven by a shaft in the inlet; in the third installation the fan was driven from the rear. These three installations, and the structures associated with them, resulted in various amounts of inlet flow distortion to the fan. The rear drive installation had less inlet flow distortion than the two front drive installations. Some measurements of inlet flow distortion were made and used in a blade passage noise generation theory to predict the effects of distortion on noise. Good agreement was obtained when the predicted and measured power level differences between the front drive and rear drive installations were compared. Author

N72-28288*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHOKED FLOW OF FLUID NITROGEN WITH EMPHASIS ON THE THERMODYNAMIC CRITICAL REGION
R. C. Hendricks, R. J. Simoneau, and R. C. Ehlers 1972 28 p refs Presented at Cryog. Eng. Conf., Boulder, Colo., 9-11 Aug. 1972
(NASA-TM-X-68107; E-7044) Avail: NTIS HC $3.50 CSCL 20D

Experimental measurements of critical flow rate and pressure ratio for nitrogen flowing through a nozzle are presented. Data for selected stagnation isotherms from 87.5 to 234 K with pressures to 9.3 MN/m2 are compared to an equilibrium model with real fluid properties and also a nonequilibrium model. Critical flow pressure ratio along an isotherm tends to peak while the flow rate indicates an inflection. The point is closely associated with the transposed critical temperature and represents a change in the fluid structure. Author

N72-28289# Joint Publications Research Service, Arlington, Va.
THE THEORY OF FLOWS WITH FREE SURFACES
M. I. Gurevich 14 Jul. 1972 126 p refs Transl. into ENGLISH from Gidromekhan. (Moscow), v. 5, 1971 p 38-114
(JPRS-56501) Avail: NTIS HC $8.50

A survey devoted to the consideration of liquid flows limited by moving or fixed walls and free surfaces is presented that considers works published after 1960. Investigation of cavitational flow over hydrofoils is also considered. Author

N72-28290*# Scientific Translation Service, Santa Barbara, Calif.
EXPERIMENTAL STUDY OF DIFFUSER CHANNELS WITH PRESEPARATION STATE OF THE TURBULENT BOUNDARY LAYER
L. A. Bychkova Washington NASA Jul. 1972 12 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (Moscow), V. 21, no. 3, Sep. 1971 p 518-523
(Contract NASw-2035)
(NASA-TT-F-14366) Avail: NTIS HC $3.00 CSCL 20D

An experimental study is presented of preseparation diffuser channels of circular cross section. The geometric and aerodynamic characteristics of the channels were determined as functions of the degree of initial inhomogeneity of the flow, on the basis of a semiempircial method of calculating the turbulent boundary layer, starting from the condition that the flow is at the preseparation stage. The calculation was performed with an accuracy equal to that of the empirical constant figuring in the determination of the mixing path length. The velocity profiles were measured on models of diffusers of circular cross section in a number of cross sections, on the basis of which the nominal areas of the boundary layer were calculated. Author

N72-28291*# Translation Consultants, Ltd., Arlington, Va.
ON THE MOVEMENTS OF A VISCOUS, COMPRESSIBLE, HEAT-CONDUCTING FLUID IN A SPHERICAL LAYER
N. M. Astafyeva, I. Yu Brailovskaya, and I. M. Yavorskaya Washington NASA Aug. 1972 23 p refs Transl. into ENGLISH of "O Dvizheniyakh Vyazkoy Szhimay Teploprovodnoy Zhidkosti v Sfericheskom Sloye", Rept. Pr-96. Acad. Sci. USSR, Moscow, 1972 28 p
(Contract NASw-2038)
(NASA-TT-F-14373) Avail: NTIS HC $3.25 CSCL 20D

The axisymmetric motion of a viscous compressible fluid contained between two concentric spheres which rotate about a common axis with different angular velocities is investigated. The solution of full nonlinear Navier-Stokes equations with an appropriate boundary condition on the two boundary spheres is found numerically using a computer. The analysis of the results,

and their comparison with known solutions, obtained by different methods, give the complete picture of the existing meridional flow patterns, and of the distributions of the angular velocity in the spherical gap depending on the characteristic dimensionless parameters. Author

N72-28292# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
CAVITATION BUBBLE DYNAMICS RESEARCH-THEORY, INSTRUMENTATION, RESULTS
Frederick G. Hammitt Jun. 1972 50 p refs Presented at Pa. State Univ. Summer Conf. on Cavitation, Aug. 1972
(Grant NSF GK-1889)
(UMICH-03371-19-T) Avail: NTIS HC $4.50

Data covering bubble dynamics for incompressible and compressible viscous liquids are given. Data also cover spherical collapse and nonsymmetrical collapse. High speed photography as applied to cavitation research and cavitation damage testing methods are included. Author

N72-28293# Max-Planck-Institut fuer Stromungsforschung, Gottingen (West Germany).
WEDGE- AND CAPILLARY-FLOWS CONSIDERING THE TEMPERATURE AND PRESSURE DEPENDENCE OF VISCOSITY [SPALT- UND KAPILLARENSTROEMUNG BEI BERUECKSICHTIGUNG DER TEMPERATUR- UND DRUCKABHAENGIGKEIT DER VISKOSITAET]
Ulrich Rost 1971 222 p refs In GERMAN
(Rept-54) Avail: NTIS HC $13.25

The wedge gap flow between a fixed guide shoe and a movable plane surface was studied for temperature and pressure effects on lubricant viscosity in relation to a bearing. Navier-Stokes and continuity equations in combination with energy equations were used to solve the heat transfer problem by differential matrix methods. Results were strongly affected by heat transfer conditions; temperature and viscosity values changed across the gap flow whereas pressure fluctuations were not pronounced. Calculations for a rotational symmetrical fluid flow through a capillary established lesser viscosity values for a Newtonian fluid at high pressure increases. Transl. by G.G.

N72-28294*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE INTERACTION OF MODERATELY STRONG SHOCK WAVES WITH THICK PERFORATED WALLS OF LOW POROSITY
Daniel J. Grant Washington Aug. 1972 61 p refs
(NASA-TN-D-6902; G-1069) Avail: NTIS HC $3.00 CSCL 20D

A theoretical prediction is given of the flow through thick perforated walls of low porosity resulting from the impingement of a moderately strong traveling shock wave. The model was a flat plate positioned normal to the direction of the flow. Holes bored in the plate parallel to the direction of the flow provided nominal hole length-to-diameter ratios of 10:1 and an axial porosity of 25 percent of the flow channel cross section. The flow field behind the reflected shock wave was assumed to behave as a reservoir producing a quasi-steady duct flow through the model. Rayleigh and Fanno duct flow theoretical computations for each of three possible auxiliary wave patterns that can be associated with the transmitted shock (to satisfy contact surface compatibility) were used to provide bounding solutions as an alternative to the more complex influence coefficients method. Qualitative and quantitative behavior was verified in a 1.5- by 2.0-in. helium shock tube. High speed Schlieren photography, piezoelectric pressure-time histories, and electronic-counter wave speed measurements were used to assess the extent of correlation with the theoretical flow models. Reduced data indicated the adequacy of the bounding theory approach to predict wave phenomena and quantitative response. Author

N72-28295*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYTICAL INVESTIGATION OF CONICAL DIFFUSERS
James L. Means, Paul C. Glance, and Hugh A. Klassen Washington Aug. 1972 26 p refs Sponsored in part by Army Air Mobility R and D Lab.
(NASA-TM-X-2605; E-6908) Avail: NTIS HC $3.00 CSCL 20D

A study was made to determine if existing data for straight-channel single-plane divergence diffusers together with boundary-layer methods could be practically employed to predict conical diffuser performance in the high-speed flow regime. A semiempirical correlation technique, which uses the experimental performance of a straignt-channel single-plane divergence diffuser, and a momentum integral boundary-layer method were employed to predict conical diffuser performance. Neither of these methods is applicable when the boundary layer separates. The momentum integral method was used to study the relative importance of various boundary layer parameters in correlating unstalled diffuser performance. Other investigators have found that the best diffuser performance occurs when the diffuser is operating in the transitory stall regime. Since the analytical methods presented in this report are not applicable after the point of boundary-layer separation, a criterion was established from examination of experimental tests which allows the designer to ascertain approximate diffuser performance in the transitory stall regime. Author

N72-28296# Federal Aviation Administration, Washington, D.C.
FAA SYMPOSIUM ON TURBULENCE Final Report
1971 116 p Conf. held at Washington, 22-24 Mar. 1971
Avail: NTIS HC $8.00

The proceedings of a conference on turbulence are presented. The subjects discussed are wake turbulence, clear air turbulence, wind shear, upsets, thunderstorms, and turbulence plotting. The activities of various research agencies for determining the nature of air turbulence and the development of methods for detecting turbulence are described. Author

N72-28297# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
THEORETICAL INVESTIGATION OF GAS BUBBLE LIQUID MIXTURE FLOWS THROUGH CONVERGING-DIVERGING NOZZLES
Subba Rao Gutti Aug. 1972 62 p refs
(RE-436) Avail: NTIS HC $5.25

Solutions are developed for a one dimensional compressible gas bubble-liquid mixture flow through a converging-diverging nozzle. Gas is assumed in the form of spherical bubbles that do not exchange mass with the liquid, but allowance is made for a differential between bubble and liquid velocities. The critical condition for the specified initial flow conditions is found by iteration to establish the local slope of the nozzle wall at each step near the throat. Thus the critical throat is designed especially for each flow. The pressure reduces steadily through the divergent section, reaching its lowest value at the end of the section, and causing the gas and liquid velocities to reach higher values than at the throat. Author

N72-28298# Grumman Aerospace Corp., Bethpage, N.Y.
UNSTEADY NONUNIFORM FLOW MEASUREMENT BY HOT FILM ANEMOMETRY
K. M. Foreman Aug. 1972 40 p refs
(RM-551) Avail: NTIS HC $4.00

The measurement of the unsteady nonuniform flow rate of environmental waters in open channels presents conditions making conventional instruments inappropriate. Our development and demonstration of Teflon-coated hot film sensors, to measure water velocity opens the possibility of applying this rapid response technique to unsteady flow conditions. In conjunction with a rudimentary traversing apparatus, a hot film sensor was used to determine the volumetric flow rate of tap water in a laminar flow, open-channel, circular-section conduit having highly

nonuniform velocity profiles. The sensor-traverse system data exhibited good agreement with results obtained by an independent averaging method that employs timing the filling of a known volume container. The section traversal method can provide better insight into internal flow mechanisms, suvh as recirculation, and potentially offers better capability for the evaluation of the flow capacity of various portions of an open channel. Author

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N72-28299# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Trauen (West Germany). Abteilung Thermogasdynamik.

LATERAL INJECTION OF AN INCOMBUSTIBLE LIQUID INTO A HOT GAS FLOW

Werner Dobrzynski Feb. 1972 37 p refs In GERMAN; ENGLISH summary

(DLR-FB-72-19) Avail: NTIS HC $4.00; DFLVR, Porz 10,50 DM

The path of a water jet in a hot gas cross flow was determined for various inclination angles of injection, nozzle diameters, and flow parameters of the liquid and the hot gas. The jet configurations were recorded photographically and evaluated by graphic representation. The vaporization of the injected fluid and its influence upon the path line was investigated. Test results are compared with calculations and considerable differences are revealed. Interpretation of this deviation suggests that the results could be approximated more effectively by changing the jet expansion rule applied in theory, which is valid for gas injection only. ESRO

N72-28300# Clemson Univ., S.C. Water Resources Research Inst.

REDUCTION OF FLOW FRICTION WITH POLYMER ADDITIVES Completion Report, Jul. 1967 - Dec. 1970

Walter E. Castro Feb. 1972 63 p refs

(Contracts DI-14-01-0001-1861; DI-14-31-0001-3041; DI-14-01-001-1409; OWRR Proj. A-009-SC(3))

(PB-207788; WRRI-24W72-06291) Avail: NTIS HC $3.00 CSCL 20D

The bulk properties of aqueous high polymer solutions were investigated to establish a simple and reliable method for predicting friction reduction, and okra gum was investigated as a friction reducing additive in pipe flow. Experimental results indicate how some bulk properties are significantly affected by the presence of high polymers, and also show that okra gum is effective as a friction reducer in turbulent pipe flow with overall behavior comparable to polyethylene oxide. GRA

N72-28301# Institute for Defense Analyses, Arlington, Va. Jason Div.

SURFACE WAVES IN THE PRESENCE OF AN INTERNAL WAVE

Marshall Rosenbluth Nov. 1971 23 p

(Contract DAHC15-67-C-0011)

(AD-740096; P-832; IDA/HQ-72-13934) Avail: NTIS CSCL 20/4

The effect on the normal modes for surface waves in a fluid due to the presence of a single, steady long wavelength internal wave is discussed. Approximate analytic solutions are found for both the resonant and non-resonant case (the former corresponding to a group velocity for the surface wave equal to the phase velocity of the internal wave). Solutions are also found for the case of an impulsively applied internal wave interacting with a surface wave, when the two waves are at or near resonance. Author (GRA)

N72-28302 National Lending Library for Science and Technology, Boston Spa (England).

FUNDAMENTAL EXPERIMENT ON THE MECHANICAL FRACTURE OF ROCKS. COMPARISON OF THE CUTTER BIT WITH THE DISC CUTTER ON THE CHARACTER OF THE ROCK FRACTURE

S. Takaoka 30 Mar. 1972 19 p refs Transl. into ENGLISH from Saiko to Hoan (Japan), no. 1, 1971 p 2-10

(NLL-SMRE-Trans-6049-(8313.4)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The results are reported to experiments using cutter bits and disc cutters for breaking rocks to obtain data for developing and designing a tunnel boring machine. It was found that the thrust required by a cutter bit is about one-tenth of that required by a disc cutter. It is concluded that for crushing granite, it is advantageous to use a disc cutter. F.O.S.

N72-28303 National Lending Library for Science and Technology, Boston Spa (England).

THE FREQUENCY DEPENDENCE OF THE EFFECT OF THUNDERSTORM IN TROPOSPHERIC PROPAGATION

U. Kuehn 30 Mar. 1972 7 p refs Transl. into ENGLISH from Nachrichtentechnik-Elektronik (Berlin), v. 21, no. 9, Sep. 1971 p 325-327

(NLL-Trans-2837-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Studies on the relation between field strength increases and thunderstorms are reviewed, and test set-up for investigating the frequency dependence by measuring field strength increases on transhorizon land paths is described. Measurements were taken in the 100, 200, 1100, and 3500 MHz ranges during three summers. The main part of the study was on the 125-km path from Radebeul to Kolberg, which is over hilly terrain. The 208-km path Fichtelber-Kolberg path and the 191-km Katzenstein-Kolberg path have relatively flat terrain the average field strength increase is 38 db in the 3500 MHz range, 30 db in the 1100 MHz range, and about 10 db in the 100 MHz range. N.E.N.

N72-28304 National Lending Library for Science and Technology, Boston Spa (England).

FINE STRUCTURE OF THE MIDDLE AND HIGH STRATOSPHERE. DETECTION OF CLEAR AIR TURBULENCE. APPLICATION TO FLIGHTS ENVISAGED FROM SUPERSONIC TRANSPORT AIRCRAFT

G. D. Barbe et al [1972] 19 p refs Transl. into ENGLISH from the publ. "French/American Meteorological Societies Joint Meeting" Paris, 1971

(NLL-M-22438-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Wind and fine scale temperature soundings were carried out under a variety of experimental conditions. Clear air turbulence measurements observations were made using Canberra and Concorde aircraft. The results are presented in the form of curves giving the distributions as a function of altitude, height, wind speed, and temperature. K.P.D.

N72-28305 National Lending Library for Science and Technology, Boston Spa (England).

ON CHANGES IN CLIMATE, GLACIERS AND SOLAR ACTIVITY

V. N. Kupeckij [1972] 26 p refs Transl. into ENGLISH from Tr. Arkt. Antarkt. Nauchn.-Issled. Inst. (Leningrad), no. 294,

1970 p 68-86 No diagrams, etc.; to be used in conjunction with original book
(NLL-M-22456-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

Aspects of the study of changes in climate during the past century and the results of such changes are considered. Land and sea ice are considered in connection with changes in solar activity. Helioclimatic relationships were used for ice forecasts for Arctic navigation. An analysis of the evolution of Arctic glaciers is presented, as well as an analysis of glaciers in other parts of the U.S.S.R. K.P.D.

N72-28306 Department of Energy, Mines and Resources, Ottawa (Ontario).
RECORD OF OBSERVATIONS AT ALERT MAGNETIC OBSERVATORY, 1969 Publications of the Earth Physics Branch, Volume 43, No. 1
G. JansenVanBeek and H. R. Reny 1972 77 p
Copyright. Avail: Issuing Activity

Absolute determinations of D, I and F were made on the average three to four times a month during magnetically quiet periods. The method used for calculation of the Ruska X, Y and Z baseline values from absolute measurements of D, I and F was discussed in detail in the 1967 report for Alert. The baseline and scale values adopted for 1969 are in the accompanying tables. Author

N72-28307 Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch.
RECORD OF OBSERVATIONS AT VICTORIA MAGNETIC OBSERVATORY, 1970
D. R. Auld and B. D. Lowe 1972 56 p refs
(M70-43/7) Copyright. Avail: Issuing Activity

Tables on the magnetic activity recorded by the Victoria Magnetic Observatory during 1970 are presented. Data are also given on the instruments, absolute observations, and baseline values. E.H.W.

N72-28308 Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch.
RECORD OF OBSERVATIONS AT MEANOOK MAGNETIC OBSERVATORY, 1969
Anne B. Cook and Steven J. Sprysak 1972 55 p refs
(M70-42/9) Copyright. Avail: Issuing Activity

Tables are presented on the magnetic activity recorded by Meanook Magnetic Observatory for 1969. Data are also given on the measuring instruments used, absolute observations, and baseline values. E.H.W.

N72-28309*# American Univ., Washington, D.C.
ERTS-A DATA USER INVESTIGATION OF WETLANDS ECOLOGY Progress Report No. 1
Richard R. Anderson, prinicpal investigator 6 Jul. 1972 2 p
Sponsored by NASA
(E72-10001; NASA-CR-127558; GSFC-ID-UN006; PR-1) Avail: NTIS HC $3.00 CSCL 08H
This report contains no significant results. Author

N72-28310*# Maine Dept. of Transportation, Augusta.
DETECTION AND MONITORING VEGETATION DAMAGE ASSOCIATED WITH HIGHWAYS AND HIGHWAY FACILITIES Progress Report
Ernest G. Stoeckeler, principal investigator 1 Jul. 1972 2 p
(Contract NAS5-21724)
(E72-10002; NASA-CR-127557; GSFC-ID-ST350) Avail: NTIS HC $3.00 CSCL 08M
This report contains no significant results. Author

N72-28311*# Maine Dept. of Transportation, Augusta.
TO MAP THE DISTRIBUTION OF GLACIOFLUVIAL DEPOSITS AND ASSOCIATED GLACIAL LANDFORMS Progress Report
Raymond G. Woodman, principal investigator 1 Jul. 1972 1 p
(Contract NAS5-21747)
(E72-10003; NASA-CR-127556; GSFC-ID-ST354; PR-1) Avail: NTIS HC $3.00 CSCL 08E
This report contains no significant results. Author

N72-28312*# Atlantic Oceanographic and Meteorological Labs., Miami, Fla.
REMOTE SENSING OF OCEAN CURRENTS Bimonthly Report, 4 May - 4 Jul. 1972
George A. Maul, principal investigator 1 Aug. 1972 8 p
Sponsored by NASA
(E72-10004; NASA-CR-127555; GSFC-ID-CO315; ERTS-A-Proposal-108) Avail: NTIS HC $3.00 CSCL 08C
This report contains no significant results. Author

N72-28313*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
UTILIZATION OF ERTS-A DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA
Charles W. Welby, principal investigator Jul. 1972 1 p
Sponsored by NASA
(E72-10005; NASA-CR-127553; GSFC-ID-UN281; ERTS-A-Proposal-18) Avail: NTIS HC $3.00 CSCL 08G
This report contains no significant results. Author

N72-28314*# Tennessee Univ., Knoxville. Dept. of Geography.
GEOGRAPHIC APPLICATIONS OF ERTS-A IMAGERY
John B. Behder, principal investigator 28 Jun. 1972 4 p
Sponsored by NASA
(E72-10008; NASA-CR-127550; GSFC-ID-UN212) Avail: NTIS HC $3.00 CSCL 08F
This report contains no significant results. Author

N72-28315*# Purdue Univ., Lafayette, Ind. Lab. for Application of Remote Sensing.
A LAND USE CLASSIFICATION OF THE TEXOMA FRAME (AN APPROXIMATELY SQUARE AREA OF 100 NAUTICAL MILES BOUNDARY, CENTERED ON A POINT 15 MILES SOUTH-EAST OF DURANT, OKLAHOMA AND APPROXIMATELY 5 MILES NORTH OF THE RED RIVER) AND OF TWO SUB FRAMES OF THIS ENTIRE FRAME
D. A. Landgrebe, principal investigator 15 Aug. 1972 4 p
Sponsored by NASA
(E72-10009; NASA-CR-127475; GSFC-ID-UN103; ERTS-A-Proposal-SR-040) Avail: NTIS HC $4.00 CSCL 08H
This report contains no significant results. Author

N72-28316*# Dartmouth Coll., Hanover, N.H. Dept. of Geography.
LAND USE IN NORTHERN MEGALOPOLIS Progress Report
Robert B. Simpson, principal investigator 31 Jul. 1972 1 p
(Contract NAS5-21749)
(E72-10010; NASA-CR-127615; GSFC-ID-101; PR-1) Avail: NTIS HC $3.00 CSCL 08B
This report contains no significant results. Author

N72-28317*# Maine Dept. of Transportation, Augusta.
TO DEVELOP A LAND USE PEAK RUNOFF CLASSIFICATION SYSTEM FOR HIGHWAY ENGINEERING PURPOSES Progress Report
E. G. Stoeckeler, principal investigator 1 Aug. 1972 1 p
(Contract NAS5-21772)
(E72-10011; NASA-CR-127617; GSF-ID-203(ST354)) Avail: NTIS HC $3.00 CSCL 08B
This report contains no significant results. Author

N72-28318*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ERTS-A INVESTIGATION ER-600
R. Bryan Erb, principal investigator 17 Jul. 1972 8 p
(E72-10012; NASA-TM-X-68669; GSFC-ID-NA347) Avail: NTIS HC $3.00 CSCL 08D
This report contains no significant results. Author

N72-28319*# Itek Corp., Lexington, Mass. Optical Systems Div.
AUTOMATED THEMATIC MAPPING AND CHANGE DETECTION OF ERTS-A IMAGES Progress Report, 6 Jun. - 15 Jul. 1972
Nicholas Gramenopoulos, principal investigator 24 Jul. 1972 1 p
(Contract NAS5-21766)
(E72-10013; NASA-CR-127616; GSFC-ID-PR504; ERTS-A-Proposal-MMC-074) Avail: NTIS HC $3.00 CSCL 08B
This report contains no significant results. Author

N72-28320*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
APPLICATION OF ERTS AND EREP IMAGES TO GEOLOGIC INVESTIGATIONS OF THE BASIN AND RANGE COLORADO PLATEAU BOUNDARY IN NORTHWESTERN AND NORTH-CENTRAL ARIZONA, NO. 308 Progress Report, 15 Jun. - 15 Aug. 1972
Alexander F. H. Goetz, principal investigator 15 Aug. 1972 2 p Sponsored by NASA
(E72-10014; NASA-CR-127704; GSFC-ID-PR522) Avail: NTIS HC $3.00 CSCL 08G
This report contains no significant results. Author

N72-28321*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
THE DEVELOPMENT OF SPECTRO-SIGNATURE INDICATORS OF ROOT DISEASE IMPACTS ON FOREST STANDS Annual Progress Report
F. P. Weber and J. F. Wear 30 Sep. 1970 55 p refs
(NASA Order W12996)
(NASA-CR-127450) Avail: NTIS HC $4.75 CSCL 02F
A field research program was begun in 1969 and intensified in 1970 on the physiology and biophysical responses of second-growth Douglas fir infected with root rot fungus. A double tramway system was suspended between three 100-foot instrument towers to carry sensors for measuring the energy response from above both healthy and infected trees. Processing and analysis was completed of airborne multispectral scanner imagery collected over the Wind River research area in 1969. Likelihood ratio processing of three-channel infrared data and Euclidean distance analysis of ten-channel spectrometer data did not identify incipient root rot infection outside the training sets. In all cases infected fir was misclassified as healthy fir. It was concluded from careful examination of physiological data that Poria root rot infection has little effect on water metabolism and energy exchange. What was identified was a low-grade stress that affects respiration and metabolism over long periods of time. This led to minor changes in the external physical symptoms of Poria-infected trees which was revealed only in the shortwave reflectance data. Author

N72-28322*# California Inst. of Tech., Pasadena.
HIGH ENERGY ELECTRON SPIKES AT HIGH LATITUDES
J. W. Brown and E. C. Stone Jan. 1972 41 p refs Sponsored in part by NSF
(Contract NAS5-3095; Grants NGL-05-002-007; NGR-05-002-160)
(NASA-CR-122512; SRL-72-1) Avail: NTIS HC $4.25 CSCL 04A
Over 750 spikes of precipitating electrons with E > or = 425 KeV were observed aboard the low altitude polar orbiter OGO-D between 30 July 1967 and 31 December 1967. The spikes may be divided into three distinct populations, depending on whether they occur at latitudes below, at, or above the local limit of trapping. Author

N72-28323*# Pittsburgh Univ., Pa. Dept. of Chemistry.
KINETICS AND MECHANISM OF THE FORMATION OF WATER CLUSTER IONS FROM O2(PLUS) AND H2O IN He, Ar, N2, AND O2 AT 296 K Ph.D. Thesis
Carleton J. Howard, Veronica M. Bierbaum, Howard W. Rundle, and Frederick Kaufman May 1972 32 p refs Sponsored in part by NSF
(Grant NGR-39-011-002; Contract DA-31-124-ARO(D)-440)
(NASA-CR-127448; SRCC-172) Avail: NTIS HC $3.75 CSCL 20H
The reaction sequence leading from O2(+) to H3O(+)-H2O was examined in He, Ar, N2 and O2 carrier gases in a flowing afterglow system. The rate constants for the reactions were measured and the kinetic analysis for their determination is presented. For M = N2, two new steps involving the formation and reaction of O2(+)-N2 were proposed and examined. The rate constants are discussed and compared with other experimental values. Author

N72-28324*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
MONITORING FOREST LAND FROM HIGH ALTITUDE AND FROM SPACE Annual Progress Report
30 Sep. 1971 180 p refs Prepared in cooperation with Calif. Univ.
(NASA Order W-13308)
(NASA-CR-127702) Avail: NTIS HC $11.00 CSCL 02F
Forest inventory, forest stress, and standardization and calibration studies are presented. These include microscale photointerpretation of forest and nonforest land classes, multiseasonal film densities for automated forest and nonforest land classification, trend and spread of bark beetle infestations from 1968 through 1971, aerial photography for determining optimum levels of stand density to reduce such infestations, use of airborne spectrometers and multispectral scanners for previsual detection of Ponderosa pine trees under stress from insects and diseases, establishment of an earth resources technology satellite test site in the Black Hills and the identification of natural resolution targets, detection of root disease impact on forest stands by sequential orbital and suborbital multispectral photography, and calibration of color aerial photography. K.P.D.

N72-28325*# Minnesota Univ., Minneapolis. School of Forestry.
REMOTE SENSING OF VIGOR LOSS IN CONIFERS DUE TO DWARF MISTLETOE Annual Progress Report
Merle P. Meyer, D. W. French, Robert P. Latham, Charles A. Nelson, and Robert W. Douglass Berkeley, Calif. Calif. Univ. Forestry Remote Sensing Lab. 30 Sep. 1971 45 p refs Prepared for Calif. Univ., Berkeley. Forestry Remote Sensing Lab. in cooperation with Dept. of Agr. Forest Serv. Original contains color illustrations
(NASA Order R-09-038-002)
(NASA-CR-127682) Avail: NTIS HC $4.25 CSCL 02F
The initial operation of a multiband/multidate tower-tramway test site in northeastern Minnesota for the development of specifications for subsequent multiband aerial photography of more extensive study areas was completed. Multiband/multidate configurations suggested by the tower-tramway studies were and will be flown with local equipment over the Togo test site. This site was photographed by the NASA RB57F aircraft in August and September 1971. It appears that, of all the film/filter combinations attempted to date (including optical recombining of several spectral band images via photo enhancement techniques), Ektachrome infrared film with a Wratten 12 filter is the best for detecting dwarf mistletoe, and other tree diseases as well. Using this film/filter combination, infection centers are easily detectable even on the smallest photo scale (1:100,000) obtained on the Togo site. Author

N72-28326*# Oregon State Univ., Corvallis. Forestry Remote Sensing Lab.
INVENTORY AND ANALYSIS OF NATURAL VEGETATION AND RELATED RESOURCES FROM SPACE AND HIGH ALTITUDE PHOTOGRAPHY Annual Progress Report
Charles E. Poulton, David P. Faulkner, James R. Johnson, David A. Mouat, and Barry J. Schrumpf 30 Sep. 1971 59 p refs Prepared in cooperation with the Dept. of Agriculture Original contains color illustrations
(NASA Order R-09-038-002)
(NASA-CR-127697) Avail: NTIS HC $5.00 CSCL 02F

A high altitude photomosaic resource map of Site 29 was produced which provided an opportunity to test photo interpretation accuracy of natural vegetation resource features when mapped at a small (1:133,400) scale. Helicopter reconnaissance over 144 previously selected test points revealed a highly adequate level of photo interpretation accuracy. In general, the reasons for errors could be accounted for. The same photomosaic resource map enabled construction of interpretive land use overlays. Based on features of the landscape, including natural vegetation types, judgements for land use suitability were made and have been presented for two types of potential land use. These two, agriculture and urbanization, represent potential land use conflicts. Author

N72-28327*# Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo. Forestry Remote Sensing Lab.
MULTISTAGE, MULTIBAND AND SEQUENTIAL IMAGERY TO IDENTIFY AND QUANTIFY NON-FOREST VEGETATION RESOURCES Annual Progress Report
Richard S. Driscoll 30 Sep. 1971 75 p refs Prepared in cooperation with the Dept. of Agriculture Original contains color illustrations
(NASA Order R-09-038-002)
Avail: NTIS HC $5.75 CSCL 02B

Analysis and recognition processing of multispectral scanner imagery for plant community classification and interpretations of various film-filter-scale aerial photographs are reported. Data analyses and manuscript preparation of research on microdensitometry for plant community and component identification and remote estimates of biomass are included. Author

N72-28328*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
THE DEVELOPMENT OF AN EARTH RESOURCES INFORMATION SYSTEM USING AERIAL PHOTOGRAPHS AND DIGITAL COMPUTERS Annual Progress Report
Elliot L. Amidon, David A. Sharpnack, and Robert M. Russell 30 Sep. 1971 10 p refs
(NASA Order R-09-038-002)
(NASA-CR-127690) Avail: NTIS HC $3.00 CSCL 08G

Analytical photogrammetry demonstrated that automatic three dimensional mapping of forest terrain was technically feasible. The examples were black and white photography at scales of 1:10,000 and 1:24,000. The major improvement in terrain modelling was the addition of the capability of joining small quadrangles together to form one large model about equal to the effective area of the pair of photographs. Improvements of somewhat lesser importance include: (1) the use of up to 16 grey levels; (2) the elimination of several coordinate transformations; and (3) the annotation of three-tone hysocline maps with elevations. Author

N72-28329*# California Univ., Berkeley. Forestry Remote Sensing Lab.
ANALYSIS OF REMOTE SENSING DATA FOR EVALUATING VEGETATION RESOURCES Annual Progress Report
30 Sep. 1971 204 p refs Prepared in cooperation with Forest Service, Washington, D. C. Original contains color illustrations
(NASA Order W-13308; NASA Order W-13300)
(NASA-CR-127443) Avail: NTIS HC $12.25 CSCL 02B

Increased utilization studies for current remote sensor and analysis capabilities included: (1) a review of testing procedures for quantifying the accuracy of photointerpretation; (2) field tests of a fully portable spectral data gathering system, both on the ground and from a helicopter; and (3) a comparison of three methods for obtaining ground information necessary for regional agricultural inventories. A version of the LARS point-by-point classification system was upgraded by the addition of routines to analyze spatial data information. Author

N72-28330# Helsinki Univ. of Technology, Otaniemi (Finland).
EFFECT OF WEATHER ON WATER ECONOMY AND CROP YIELDS
Jussi Hooli 1971 247 p refs In FINNISH; ENGLISH summary
Avail: NTIS HC $14.50

The dependence of crop yields on weather and soil factors in south and southwest Finland where water conservation is practiced was investigated. The study is based on meteorological and agricultural statistics and on data collected at several experimental stations over periods of from 15 to 40 years. Over half of the land consists of drought-sensitive sandy and clay soils. Spring-sown cereals, potatoes, and hay were studied, and precipitation, temperature, relative humidity, and cloud cover were analyzed, along with snow depth and ground frost thickness where hay was harvested. Spring cereal yields were affected by precipitation more in sandy than in clay soils. Rain had practically no effect on yields on peaty soils. It is concluded that differences in yield dependence on precipitation are due to differences in soils and water economy. N.E.N.

N72-28331# National Physical Lab., New Delhi (India). Radio Science Div.
IONOSPHERIC DATA, OCTOBER 1970
Oct. 1970 79 p
(RTRC-A185) Avail: NTIS HC $6.00

Tables of hourly values of propagation data for the E and F regions are presented for several stations in India. The data include critical frequency, minimum virtual height, F-min, and M(3000)F2 data. Author

N72-28332*# Maryland Univ., College Park. Inst. for Fluid Dynamics and Applied Mathematics.
SM91: OBSERVATIONS OF INTERCHANGE BETWEEN ACCELERATION AND THERMALIZATION PROCESSES IN AURORAL ELECTRONS
Morris Pongratz Apr. 1972 14 p ref Presented at 53d Ann. AGU meeting, Washington, 20 Apr. 1972
(Contract NSR-21-002-077; Grant NGR-21-002-008)
(NASA-CR-127560) Avail: NTIS HC $3.00 CSCL 04A

Results from a Nike-Tomahawk sounding rocket flight launched from Fort Churchill are presented. The rocket was launched into a breakup aurora at magnetic local midnight on 21 March 1968. The rocket was instrumented to measure electrons with an electrostatic analyzer electron spectrometer which made 29 measurements in the energy interval 0.5 KeV to 30 KeV. Complete energy spectra were obtained at a rate of 10/sec. Pitch angle information is presented via 3 computed average per rocket spin. The dumped electron average corresponds to averages over electrons moving nearly parallel to the B vector. The mirroring electron average corresponds to averages over electrons moving nearly perpendicular to the B vector. The average was also computed over the entire downward hemisphere (the precipitated electron average). The observations were obtained in an altitude range of 10 km at 230 km altitude. Author

N72-28333*# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
TROPOSPHERIC RANGE ERROR PARAMETERS: FURTHER STUDIES
Helen S. Hopfield Jun. 1972 51 p refs Sponsored by NASA
(Contract N00017-72-C-4401)
(NASA-CR-127559; APL/JHU-CP-015) Avail: NTIS HC $4.75 CSCL 01B

Improved parameters are presented for predicting the tropospheric effect on electromagnetic range measurements from surface meteorological data. Parameters are given for computing the dry component of the zenith radio range effect from surface pressure alone with an rms error of 1 to 2 mm, or the total range effect from the dry and wet components of the surface refractivity, N, and a two-part quartic profile model. The parameters were obtained from meteorological balloon data with improved procedures, including the conversion of the geopotential heights of the balloon data to actual or geometric heights before using the data. The revised values of the parameter k show more latitude variation than is accounted for by the variation of g. This excess variation of k indicates a small latitude variation in the mean molecular weight of air and yields information about the latitude-varying water vapor content of air. Author

N72-28334*# Biospherics, Inc., Rockville, Md.
AIRBORNE MICROWAVE RADIOMETRIC DATA ANALYSIS, PART 2 Final Report
13 Jun. 1972 62 p
(Contract NAS5-21674)
(NASA-CR-122444) Avail: NTIS HC $5.25 CSCL 08G

Between 6 March and 13 March 1972, NASA conducted a series of remote sensing experiments over the Imperial Valley, California and Phoenix, Arizona. NASA personnel employed the use of a Convair 990 fitted with microwave radiometers and photographic equipment in several overflights of the area. Ground-based operations, which included the coordination of sampling teams, placement of flight line markers, soil sample collection, soil moisture analysis, field observations, photography and data handling, are discussed. Author

N72-28335# Eberline Instrument Corp., Santa Fe, N.Mex. Dept. of Nuclear Science.
ENVIRONMENTAL RADIOACTIVITY SURVEILLANCE PROGRAM Preoperational Report, First Quarter 1972
1972 26 p
Avail: NTIS HC $3.50

The quality control program includes the use of internal tracers wherever possible, the analysis of blank samples, and the analysis of samples to which known amounts of radioactive material were added. Tables of data are presented for tests made on air particulates, surface water, well water, silt, fish, milk, and rabbits. Author

N72-28336*# Techtran Corp., Glen Burnie, Md.
COMPARISON OF SOIL TEMPERATURE DATA OBTAINED FROM DIFFERENT KINDS OF SOIL
Lajos Olah Washington NASA Jun. 1972 11 p Transl. into ENGLISH from Orszagos Meteorologiai Intezet, Hivatalos Kiadv. (Hungary), v. 25, 1962 p 96-101
(Contract NASw-2037)
(NASA-TT-F-14287) Avail: NTIS HC $3.00 CSCL 08M

Six types of soil ranging from sand to clay, with and without vegetation, were investigated. Results showed that greatest differences (in soil) were found in summer. Looser soils warm and cool faster, vegetation hinders warming, and moisture content is the most consistent regulator of soil temperature. Only bare soils present truly comparable values. Author

N72-28337# National Physical Lab., New Delhi (India). Radio Propagation Unit.
IONOSPHERIC PREDICTIONS FOR AUGUST 1972
Mar. 1972 4 p
(RRC-B191) Avail: NTIS HC $3.00

Graphs of predicted median foF2 values and predicted median MUF(4000)F2 values are presented, along with a nomogram for transforming F2-zero-MUF and F2-4000-MUF to equivalent maximum usable frequencies at intermediate transmission distances. Author

N72-28338# National Physical Lab., New Delhi (India).
IONOSPHERIC PREDICTIONS JULY 1972
Mar. 1972 4 p
(RRC-B190) Avail: NTIS HC $3.00

Graphs of predicted median foF2 values and predicted median MUF(4000)F2 values are presented, along with a nomogram for transforming F2-zero-MUF and F2-4000-MUF to equavilent maximum usable frequencies at intermediate transmission distances. Author

N72-28339# Ludwig-Maximilians-Universitat, Munich (West Germany). Meteorologisches Inst.
SPECTRAL RADIOMETER WITH HIGH SPATIAL RESOLUTION FOR INDIRECT SOUNDINGS OF THE ATMOSPHERE
H.-J. Bolle Apr. 1972 77 p refs In GERMAN; ENGLISH summary
(BMBW-FB-W-72-09) Avail: NTIS HC $6.00; ZLDI Munich: 16 DM

For indirect soundings of the atmosphere - determination of mass and temperature profiles - a balloon borne radiometer with small FOV is described which can also be used for horizon scanning. The instrument consist of a 30 cm Cassegrain system with a build in black body of conical shape for absolute calibration. Two detectors which get radiation from a beam splitter enable simultaneous measurements in two channels. Four interference filters can be turned into each of the two channels. An exchangeable aperture stop limits the FOV between 2 and 20 arc minutes. Author

N72-28340# Danish Meteorological Inst., Charlottenlund.
GODHAVN GEOPHYSICAL OBSERVATORY MAGNETIC RESULTS, 1965
1972 60 p refs
(ISBN-87-7478-044-1) Avail: NTIS HC $5.00

The magnetographs at the Godhavn Geophysical Observatory in Denmark and determination of baseline values and reduction formulas are discussed. Tables are presented for: (1) hourly means, extreme values, and daily ranges of H, D, and Z, as well as K indices; (2) hourly ranges of H, D, and Z; (3) summaries of hourly means and ranges; and (4) annual mean values for 1926 to 1965. K.P.D.

N72-28341# Danish Meteorological Inst., Charlottenlund.
OCEANOGRAPHICAL OBSERVATIONS FROM DANISH LIGHT-VESSELS AND COASTAL STATIONS, 1971
1972 154 p In DANISH and ENGLISH
(ISBN-87-7478-057-3) Avail: NTIS HC $9.75

Oceanographic observations are presented, as well as observations of the direction, height, and period of the waves. Synoptic meteorological observations made at the Danish light ships are also given. The observations for determining the temperature and the salinity of the water were made at 80 hours at all stations. Hours are in Danish time (GMT + 1). Author

N72-28342# Danish Meteorological Inst., Charlottenlund.
RUDE SKOV GEOPHYSICAL OBSERVATORY MAGNETIC RESULTS, 1968
Axel Hansen 1972 44 p
(ISBN-87-7478-056-5) Avail: NTIS HC $4.25

The results are presented of the standard observations carried out at the Rude Skov magnetic observatory in Denmark during 1968. An investigation was made of the disturbing magnetic field from an electric railway upon the observational data. Tables are given for the magnetic observations. K.P.D.

N72-28343# New Zealand. Dept. of Scientific and Industrial Research, Wellington. Geophysics Div.
NEW ZEALAND SEISMOLOGICAL REPORT, 1967 Seismological Observatory Bulletin
1972 542 p

(E-149) Avail: NTIS HC $29.25

Tabulated data on earthquakes in the New Zealand area during 1967 are presented. The tables include data for regions within and beyond 10 deg of Wellington, and reports of earthquakes felt by observers around the country. Information on instruments and stations is also given. N.E.N.

N72-28344# Ludwig-Maximilians-Universitat, Munich (West Germany). Fakultaet fuer Geowissenschaften.

OBSERVATIONAL RESULTS FROM THE GEOMAGNETIC OBSERVATORY FUERSTANFELDBRUCK FOR THE YEAR 1971 [ERGEBNISSE DER BEOBACHTUNGEN AM ERDMAGNETISCHEN OBSERVATORIUM FUERSTENFELDBRUCK IM JAHRE 1971]

1972 60 p In GERMAN

(Ser-A-Nr-14) Avail: NTIS HC $5.00

Reported are absolute measurements of earth magnetic field declination, horizontal intensity, and vertical intensity on a weekly basis. Data tables of magnetic earth pulsations and earth tides are included. Transl. by G.G.

N72-28345*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

PLATE DRIFT IN THE AFAR AND ISSAS TERRITORY (FRENCH SOMALIA) AND EASTERN ETHIOPIA AS SEEN ON SPACE PHOTOGRAPHY

Dietrich Bannert Washington Jun. 1972 26 p refs Original contains color illustrations

(NASA-TN-D-6277; MSC-S-253) Avail: NTIS HC $3.00 CSCL 08E

Apollo 9 photographs of the region northwest of the Gulf of Tadjura were studied. The occurrence of a large region of basement rocks, probably crystalline in nature, with a strongly faulted overlayer was recognized and has been named the Tadjura uplift. Study of this region is adding detailed knowledge to the literature on the phenomenon of plate drift in the southern Red Sea region. Author

N72-28346*# Metropolitan Washington Council of Governments, D.C.

REMOTE SENSING PROJECT Final Report

Harry J. Mallon and Joan Y. Howard Feb. 1972 29 p

(NASA Order W-13318; Contract DI-14-08-0001-12708)

(NASA-CR-127474; TR-8; USGS-IR-NASA-226) Avail: NTIS HC $3.50 CSCL 08G

The accomplishments and publications developed during the study are summarized. They illustrated a series of practical applications of remote sensing data to the urban-regional planning processes in the metropolitan Washington area. Author

N72-28347*# George Washington Univ., Washington, D.C.

PLANNING AND PROGRAMING IN THE SOIL CONSERVATION SERVICE

Roy M. Gray (Dept. of Agr.) Jun. 1972 30 p refs Presented at Seminar No. 3 of an Evening Ser. on Technol. Assessment Methodology, Washington, D. C., 18 May 1972

(Grant NGL-09-010-030)

(NASA-CR-127436; GWPS-MON-13) Avail: NTIS HC $3.75 CSCL 08M

The historical base is presented for the framework plan for soil conservation. Conservation effects, resource management systems, and accomplishments, activities, and costs of the Soil Conservation Service are discussed. K.P.D.

N72-28348*# Metropolitan Washington Council of Governments, D.C.

BENEFITS FROM REMOTE SENSING DATA UTILIZATION IN URBAN PLANNING PROCESSES AND SYSTEM RECOMMENDATIONS

Harry J. Mallon and Joan Y. Howard Jan. 1972 49 p refs

(NASA Order W-13318; Contract DI-14-08-0001-12708)

(NASA-CR-127476; TR-6; USGS-IR-NASA-227) Avail: NTIS HC $4.50 CSCL 08G

The benefits of utilizing remote sensor data in the urban planning process of the Metropolitan Washington Council of Governments are investigated. An evaluation of sensor requirements, a description/ comparison of costs, benefits, levels of accuracy, ease of attainment, and frequency of update possible using sensor versus traditional data acquisition techniques are discussed. Author

N72-28349*# Scientific Translation Service, Santa Barbara, Calif.

A NEW METHOD FOR THE SOIL MOISTURE MEASUREMENT (MOMIN'S METHOD)

J. Kubo Washington NASA Jul. 1972 9 p refs Transl. into ENGLISH from Agr. Meteorol. (Japan), v. 8, 1953 p 108-110

(Contract NASw-2035)

(NASA-TT-F-14394) Avail: NTIS HC $3.00 CSCL 08M

A method is discussed for measuring soil moisture, utilizing thermal conductivity. This method was found satisfactory for a fixed location. Author

N72-28350# Joint Publications Research Service, Arlington, Va.

PHYSICS OF FRESHWATER ICE

V. V. Bogorodskiy 12 Jul. 1972 42 p Transl. into ENGLISH from "Fizika Presnovodnogo Lda" Leningrad, 1971 p 28-62

(JPRS-56477) Avail: NTIS HC $4.25

Three articles dealing with the growth and development of ice crystals, their classification, the thermal properties of ice including distribution of temperature and the radiation properties of ice are presented. Author

N72-28351*# Translation Consultants, Ltd., Arlington, Va.

METHOD OF CALCULATING SOIL TEMPERATURE AT A DEPTH OF 5 cm FROM ATMOSPHERIC TEMPERATURE AND HUMIDITY VALUES

L. V. Popovich Washington NASA Aug. 1972 12 p refs Transl. into ENGLISH from Tr. Nauchn-Issled. Gidrometeorologicheskogo Inst. (Kiev), no. 91, 1970 p 89-98

(Contract NASw-2038)

(NASA-TT-F-14516) Avail: NTIS HC $3.00 CSCL 08M

The application of an averaging method for soil temperature determination from atmospheric temperature and humidity values is discussed. Calculations are made and graphs and charts are compiled for use in determining soil temperature at a depth of 5 cm under natural cover. Author

N72-28352*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

FOUR DIMENSIONAL STUDIES IN EARTH SPACE

R. S. Mather Jul. 1972 29 p refs

(NASA-TM-X-65958; X-553-72-230) Avail: NTIS HC $3.50 CSCL 04A

A system of reference which is directly related to observations, is proposed for four-dimensional studies in earth space. Global control network and polar wandering are defined. The determination of variations in the earth's gravitational field with time also forms part of such a system. Techniques are outlined for the unique definition of the motion of the geocenter, and the changes in the location of the axis of rotation of an instantaneous earth model, in relation to values at some epoch of reference. The instantaneous system referred to is directly related to a fundamental equation in geodynamics. The reference system defined would provide an unambiguous frame for long period studies in earth space, provided the scale of the space were specified. Author

N72-28353*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OGO-4 OBSERVATIONS OF THE 6300 A NIGHT AIRGLOW FROM 40 DEG N TO 40 DEG S: A SET OF 19 COLOR

MAPS

Edith I. Reed and Jacques E. Blamont (CNRS, Verrieres-le-Buisson, France) May 1972 27 p refs Original contains color illustrations

(NASA-TM-X-65954; X-625-72-173) Avail: NTIS HC $3.50 CSCL 04A

Data for the 6300 A line of atomic oxygen from the main body airglow photometer on the OGO-D satellite are summarized in a set of 19 maps for various local times at night between 30 August 1967 and 10 January 1968. Author

N72-28354*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

RESULTS OF THE BALLOON ATMOSPHERIC PROPAGATION EXPERIMENT FLIGHTS OF 1970 (BAPE 1)

Peter O. Minott, Jack L. Bufton, and Michael W. Fitzmaurice Mar. 1972 130 p refs

(NASA-TM-X-65952; X-524-72-125) Avail: NTIS HC $8.50 CSCL 04A

Two laser beams, one argon (5145 A) and one CO2 (10.6 microns), were propagated over vertical path from the ground to receivers located above the atmosphere, and the scintillation of the beams was measured. Simulataneous measurement of the state of turbulence along the path permitted the comparison of scintillation statistics with theory. The effects of atmospheric turbulence over a vertical or near-vertical path are discussed. K.P.D.

N72-28355*# Translation Consultants, Ltd., Arlington, Va.

SOME BEHAVIOR PATTERNS IN THE REDISTRIBUTION OF MOISTURE ON SLOPES

Ye. N. Romanova Washington NASA Jul. 1972 23 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 147, 1963 p 66-82

(Contract NASw-2038)

(NASA-TT-F-14352) Avail: NTIS HC $3.25 CSCL 08M

A method for calculating the redistribution of water from summer rains over undulating relief is provided. The method is used to determine the amount of water entering the soil over different sections of slopes. The amount of water absorbed by soil on slopes, and at their base is calculated for several points by type of soil. Author

N72-28356*# Scientific Translation Service, Santa Barbara, Calif.

THERMAL PROPERTIES OF THE SOIL AS A FUNCTION OF ITS MOISTURE AND COMPACTNESS

A. I. Gupalo Washington NASA Jul. 1972 13 p refs Transl. into ENGLISH from Pochvovedenie (Moscow), no. 4, Apr. 1959 p 40-45

(Contract NASw-2035)

(NASA-TT-F-14364) Avail: NTIS HC $3.00 CSCL 08M

Heat conductivity, temperature conductivity, and volume heat capacity were determined for the southern chernozem region as a function of its density and moisture. These properties were found to vary with the stage of soil moistening. It is concluded that the mechanism of heat conductivity of moist soil depends upon the mechanism of moisture conductivity and on the character of water binding by soil particles. Author

N72-28357*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THEORETICAL MODEL FOR THE LATITUDE DEPENDENCE OF THE THERMOSPHERIC ANNUAL AND SEMIANNUAL VARIATIONS

H. G. Mayr and H. Volland (Bonn Univ.) Jun. 1972 29 p refs Submitted for publication

(NASA-TM-X-65961; X-621-72-235) Avail: NTIS HC $3.50 CSCL 04A

A three-dimensional model for the annual and semiannual variations of the thermosphere is presented in which energy and diffusive mass transport associated with the global circulation are considered in a self-consistent form. It is shown that these processes play a major role in the thermosphere dynamics and account for a number of temperature and compositional phenomena. Author

N72-28358*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A NUMERICAL STUDY OF A THREE DIMENSIONAL SPHERICAL THERMOSPHERIC DENSITY AND WIND MODEL

H. Volland (Bonn Univ.) and H. G. Mayr Jun. 1972 47 p refs Submitted for publication

(NASA-TM-X-65960; X-621-72-234) Avail: NTIS HC $4.50 CSCL 14B

Numerical calculations of the generation and propagation of the two important fundamental symmetric tidal wave modes - the diurnal mode (1, 1, 1,) and the semidiurnal mode (2, 2, 2) - were performed applying a realistic model thermosphere and taking into account heat conduction and the temporally and spatially varying ion-neutral collision number. Both wave modes are predominantly generated by the solar EUV heat input. It is shown that the latitude structure of the (1, 1, 1)-mode which is identical with the Hough function(1, -1) within the lower non-dissipative atmosphere degenerates into the spherical function P sub 1, 1 at thermospheric heights. The pressure field of this mode constitutes the observed pressure bulge of the thermosphere, the diurnal component of which peaks at 15 h L. T. The electric polarization field of the geomagnetic Sq current generates a significant fraction of this wave mode at F layer heights. This wave component shifts the total horizontal wind system to earlier times by about 1 hour in agreement with ionospheric observations. The latitude structure of the (2, 2, 2) mode is identical with the Hough function (2, 2) within the lower non-dissipative atmosphere. It degenerates to the spherical function P sub 2, 2 at thermospheric heights. Author

N72-28359*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A TWO COMPONENT MODEL OF THE DIURNAL VARIATIONS IN THE THERMOSPHERIC COMPOSITION

H. G. Mayr and H. Volland (Bonn Univ.) Jun. 1972 23 p refs Submitted for publication

(NASA-TM-X-65959; X-621-72-233) Avail: NTIS HC $3.25 CSCL 04A

A self-consistent, two-dimensional, two-component diffusion model is presented to describe the diurnal component of thermosphere dynamics. In the regions where oxygen and helium are the minor constituents, diffusion is shown to increase the amplitudes of these constituents and to advance the times of their diurnal maxima by several hours with respect to the gas temperature and the major species. Both effects are in basic agreement with satellite observations. The diffusion process is relatively insignificant for temperature, total mass density, and wind fields. The magnitude of the temperature-density phase delay is discussed with respect to its dependence on the electron density distribution. Author

N72-28360*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

POLAR MOTION FROM LASER TRACKING OF ARTIFICIAL SATELLITES

David E. Smith, Ronald Kolenkiewicz, Peter J. Dunn (Wolf R and D Corp., Md.), Henry H. Plotkin, and Thomas S. Johnson Jul. 1972 8 p refs Submitted for publication

(NASA-TM-X-65964; X-553-72-247) Avail: NTIS HC $3.00 CSCL 08E

Laser ranges to the Beacon Explorer C spacecraft from a single Goddard Space Flight Center tracking system were used to determine the change in latitude of the station arising from polar motion. A precision of 0.03 arcsecs rms was obtained for the latitude during a five-month period in 1970. Author

N72-28361*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PARTICLE AND FIELD OBSERVATIONS FROM EXPLORER 45 DURING THE DECEMBER 1971 MAGNETIC STORM PERIOD
R. A. Hoffman Jul. 1972 17 p refs Submitted for publication
(NASA-TM-X-65963; X-646-72-242) Avail: NTIS HC $3.00 CSCL 03B

Simultaneous observations are presented from the S3-A (Explorer 45) satellite of the magnetic signature of the ring current and complete measurements of the proton ring current to distances of 5.24 R sub E during the double magnetic storm of 16 to 19 December 1971. Author

N72-28362# Finnish Meteorological Inst., Helsinki.
MEASUREMENTS OF RADIATION AND BRIGHT SUNSHINE 1969-1970
1972 85 p In ENGLISH and FINNISH
Avail: NTIS HC $6.25

Results obtained from the observations of radiation and sunshine made at Finnish stations during the years 1969 and 1970 are presented. Radiation measurements were made at five stations: Helsinki (Ilmala and Saatalo), Piikkio, Jokioinen, Luonetjarvi and Sodankyla. The geographical coordinates and heights of the stations, the height at which the observing instruments were installed, and the type of observing and recording instruments in use are given. The position of stations at which sunshine recordings were made; their geographical positions and heights, and the use of a heating apparatus, where fitted, are also indicated. Author

N72-28363# National Research Council of Canada, Ottawa (Ontario).
PHOTOGRAMMETRIC ASPECTS OF PRECISION PROCESSING OF ERTS-A IMAGERY
Vladimir Kratky [1971] 36 p refs
Avail: NTIS HC $4.00

The ERTS-A imagery as formed aboard the satellite by the return beam vidicon (RBV) camera and multispectral scanning system (MSS), radio transmitted to earth and displayed by special reproducers, will be considerably distorted due to several factors. The character of the distortion depends mainly on the geometric properties of the imaging system and on the dynamic flight conditions. The RBV geometry is analyzed with attention to electronic distortion. Appropriate analytical formulation based on polynomial and projective transformation is shown to be capable of providing line modulation control. The geometry of MSS images is discussed in detail with respect to the distorting effects of earth rotation and the applied cartographic projection. The combined effect of these factors is assessed by means of expected errors and illustrated by several tables. Author

N72-28364# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS RELATIVE TO CARTOGRAPHY AND SURVEYING. SERIES 1: GERMAN CONTRIBUTIONS AND INFORMATION. NO. 54: PRECISION PROPERTIES OF PHOTOGRAMMETRIC MODEL COORDINATES Ph.D. Thesis - Technische Hochschule, Karlsruhe [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN. REIHE I: DEUTSCHE BEITRAEGE UND INFORMATIONEN. HEFT NR. 54: GENAUIGKEITSEIGENSCHAFTEN PHOTOGRAMMETRISCHER MODELLKOORDINATEN]
Karl Schuerer 1971 137 p refs In GERMAN
Avail: NTIS HC $9.00

Image errors for signaled points on polyester-based aerial film are analyzed for their precision differences and effects in photogrammetric modelling. The errors are separated according to systematic and accidental aspects, and accidental image errors are then transfered to the photogrammetric model according to the error continuity law. Results show that geometrical errors in optical image forming are only important it they cannot be eliminated by image coordinate corrections. The median error of coordinates on polyester films is much smaller than that for acetate films; errors increased from picture center towards picture edges by a median factor of 1 to 2. Transl. by G.G.

N72-28365# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
LAVERTON-EDJUDINA AIRBORNE MAGNETIC AND RADIOMETRIC SURVEY, WESTERN AUSTRALIA 1969
D. B. Tipper and R. M. Gerdes 1971 112 p refs
(Bull-118) Avail: NTIS HC $7.75

An airborne magnetic and radiometric survey of the Laverton and Edjudina 1:250,000 map areas was flown in 1966 to assist the systematic regional geological mapping of the Western Australia Precambrian Shield, and the search for metals. The magnetic pattern is attributed to differences in magnetic properties between rock units at or near ground level. Geological strikes and the boundaries of major rock units were interpreted by delineating magnetic trends, by subdividing the area into zones of specified magnetic character, and by assessing the geological significance of these zones by reference to mapped geology. The area comprises heterogeneous acidic igneous masses, with ill-defined more basic regions, which enclose elongated outcrops of interbedded lava and sediment sequences. Areas where geological and magnetic evidence conflict are discussed in some detail. Sixteen fold axes, one cross-fold axis, twelve major dikes (one remanently magnetized), and fourteen faults were delineated. Ultrabasic intrusions could not be resolved with absolute certainty from the magnetic pattern. The radiometric data reveal many high anomalies which are mainly correlated with granite outcrops. Eighty-three radiometric anomalies satisfying the point-source criteria were detected and, of these, fifty-one are recommended for ground investigation. Author

N72-28366*# Michigan Univ., Ann Arbor. Willow Run Labs.
THE NASA EARTH RESOURCES SPECTRAL INFORMATION SYSTEM: A DATA COMPILATION
Virginia Leeman, Dianne Earing, Robert K. Vincent, and Sharon Ladd May 1971 574 p refs
(Contract NAS9-9784)
(NASA-CR-115757; WRL-31650-24-T) Avail: NTIS HC $30.75 CSCL 08G

The NASA Earth Resources Spectral Information System and the information contained therein are described. It contains an ordered, indexed compilation of natural targets in the optical region from 0.3 to 45.0 microns. The data compilation includes approximately 100 rock and mineral, 2600 vegetation, 1000 soil, and 60 water spectral reflectance, transmittance, and emittance curves. Most of the data have been categorized by subject, and the curves in those subject areas have been plotted on a single graph. Those categories with too few curves and miscellaneous categories have been plotted as single-curve graphs. Each graph, composite of single, is fully titled to indicate curve source and is indexed by subject to facilitate user retrieval. Author

N72-28367# Illinois Univ., Urbana. Aeronomy Lab.
COMMENTS OF LUNAR VARIATIONS IN THE PERUVIAN ELECTROJET
Marvin A. Geller [1972] 10 p refs Submitted for publication
(Grant NSF GA-25660)
Avail: NTIS HC $3.00

An analysis was made of L sub 2 (H), the lunar semidiurnal variation in the horizontal geomagnetic field at Huancayo, and L sub 2 (V), the lunar daily variation in the E-region electron drift at Jicamarca (located about 170 km west of Huancayo). These parameters were then used to study the lunar variations in the equatorial electrojet which is known to pass overhead in the vicinity of Huancayo. Annual variation in both L sub 2(H) and L sub 2 (V) phase and magnitude are attributed to phase lag resulting from annually varying atmospheric temperature structures; during the months May to August there is a large trapping of wave energy below the mesopause region with a much lesser trapping during November to February. Increased

trapping results in lesser magnetitude and phase of tidal variations above mesopause. G.G.

N72-28368# National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.

OCEANOGRAPHY: A BIBLIOGRAPHY OF SELECTED ACTIVATION ANALYSIS LITERATURE

G. J. Lutz, ed. Jun. 1970 37 p refs

(NBS-TN-534) Avail: SOD $0.50 as C 13.46:534

A bibliography of oceanography reports is submitted. The bibliography uses a process of activation analysis and is reindexed in detail with respect to element determined, matrix analyzed, and technique used for precise literature searching. An author index is included. The oceanography document is extracted from matrix analyzed categories of fish, shellfish, seaweed, marine sediments, and sea water. Author

N72-28369# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.

A PROGRAM FOR CALCULATING THREE-DIMENSIONAL ACOUSTIC-GRAVITY RAY PATHS IN THE ATMOSPHERE

T. M. Georges Aug. 1971 46 p refs

(NOAA-TR-ERL-212-WPL-16) Avail: SOD $0.50

The ITS-Jones-Haselgrove ray tracing program is adapted to calculate acoustic-gravity ray paths in a compressible atmosphere with arbitrary three dimensional wind and temperature variability and spherical earth. The program and its use are described, including deck listings and sample runs. Application to ocean acoustics should be possible with little modification. Author

N72-28370*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

RING CURRENT PARTICLE DISTRIBUTIONS DURING THE MAGNETIC STORMS OF 16-18 DECEMBER 1971

P. H. Smith and R. A. Hoffman Jul. 1972 19 p refs Submitted for publication

(NASA-TM-X-65962; X-646-72-241) Avail: NTIS HC $3.00 CSCL 03B

In an effort to summarize the constrasting development of the stormtime ring currents during the December 16-18, 1971 magnetic storms, maps were drawn indicating the proton energy density spatial/temporal distributions. The maps contain distributions for the 5 to 138 keV protons for each of seven orbits. The first storm was not characteristic of a single substorm nor a fully developed magnetic storm, but it was comprised of a sudden commencement, a positive phase, and multiple substorms producing a small depression in the magnetic field. The second storm was classical in development with a short two hour growth phase. Energy density distribution constrasts for the two storms show the second storm displayed three dominant features over the first storm. They were: (1) the intensities were 2 1/2 times larger, (2) the depths of penetration were 1/2 to 1 Reynolds number lower, and (3) the distribution became symmetric. Author

N72-28371# National Oceanographic Instrumentation Center, Washington, D.C.

MODEL MO. 21 RECORDING CURRENT METER, THE PLESSEY COMPANY, LIMITED, MARINE SYSTEMS DIVISION, ILFORD, ESSEX, ENGLAND

Jul. 1972 15 p

(IFS-73001) Avail: NTIS HC $3.00

A self-contained instrument package designed to measure the speed and direction of waterflow in oceans, lakes, and rivers is described. The meter can operate at a depth of 6,500 feet and is arranged to make a series of four measurements every ten minutes. The measurements, in a pure binary code of long and short pulses, are simultaneously recorded on standard magnetic tape and transmitted by an acoustic transducer. Operating power is supplied by six 1.5 volt dry cells with nonmagnetic cases by a Kalium battery pack. Performance tests of the instrument are discussed and the results are presented in the form of graphs and tables Author

N72-28372# National Oceanic and Atmospheric Administration, Rockville, Md.

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES

Jan. 1972 41 p

(IFYGL-Bull-1) Avail: NTIS HC $4.25

A preliminary overview of the present status of the organization and planning for the United States scientific program in the field operations phase of the International Field Year for the Great Lakes (IFYGL) is presented. The basic objective is the development of a sound scientific basis for water resources management as an aid in solving problems of water quality and quantity. G.G.

N72-28373# Lockheed Missiles and Space Co., Palo Alto, Calif.

MEASUREMENT OF THE INTEGRAL PARAMETERS OF THE NIGHT IONOSPHERE BY OBSERVATIONS OF INTERKOSMOS-2 SIGNALS

K. Solodovnikov, V. M. Migunov, G. V. Vladimirova, Iu. F. Vorontoov, and A. R. Iagovkin 1972 4 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 12, no. 3, 1972 p 541-543

Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Measured phase differences and angles of rotation for signal polarization from a radio station on Intercosmos 2 satellite are analyzed. It is shown that changes in the total number of ionospheric electrons corresponded to diurnal behavior for the majority of satellite passes; electron counts were low at night for any solar activity cycle and grew abruptly with the onset of dawn. G.G.

N72-28374# Toronto Univ. (Ontario). Faculty of Forestry.

CONSIDERATIONS INDETERMINATION, EVALUATION AND COMPUTER BANKING OF SPECTRAL SIGNATURES OF NATURAL OBJECTS

J. Vlcek Mar. 1972 31 p refs Sponsored by Forest Management Inst.

(FMR-22) Avail: NTIS HC $3.75 CSCL 02F

The most important spectral property in applications of remote sensing is the reflectance of radiant energy from natural objects. Reflectance is the ratio of reflected to incident radiation, usually expressed as a percentage. Discussed is the theory of reflectance, its measurement, its characteristics in vegetation, its statistical nature, and the outline of a data bank approach to reflectance data storage and retrieval. Author

N72-28375# Department of Energy, Mines and Resources, Ottawa (Ontario).

POLAR MAGNETIC SUBSTORMS 03 - 06, ut, 5 DECEMBER 1968 Publications of the Earth Physics Branch, Volume 42, No. 4

E. I. Loomer and G. JansenVanBeek 1972 12 p refs

Avail: NTIS HC $3.00

Magnetic effects associated with a westward traveling surge are illustrated by analysis of simple bays which occurred during three moderately weak substorms, 03 - 06 UT on December 5, 1968. South of the electrojet centre, at phi = 57 deg, magnetic effects are shown to be attributable solely to the auroral electrojet and its return currents. The azimuth of the Thule current vector, previously shown to reflect the westward extension of the electrojet in the auroral oval, is used to identify individual substorms, to estimate the rate of westward rotation of the oval, and to distinguish between trigger and main bays. All storms show a rapid decay and eastward swing in the final phase. The westward rotation of the oval, deduced from the azimuth of the Thule vector and the velocity of the D demarcation line, is found to be highly irregular. Author

N72-28376# Centre National d'Etudes Spatiales, Bretigny-sur-Orge (France).

REMOTE SENSING OF EARTH RESOURCES [LA TELEDETECTION DES RESSOURCES NATURELLES]

Oct. 1971 425 p refs Partly in ENGLISH and partly in FRENCH Proc. of Conf. held in Paris, 26-27 Oct. 1971
Avail: NTIS HC $23.25

Results and findings on earth resources performed during remote sensing of French territory are presented. Selected studies in the fields of ecology, ground truth terrain analysis, soil mapping, crop growth, infrared imagery, and balloon sounding are described. For individual titles, see N72-28377 through N72-28397.

N72-28377 Centre National d'Etudes Spatiales, Bretigny-sur-Orge (France).
THE 1970-1971 CNES REMOTE SENSING PROGRAM [LE PROGRAMME CNES DE TELEDETECTION EN 1970-1971]
A. Alouges *In its* Remote Sensing of Earth Resources Oct. 1971 p 0-6 In FRENCH (For availability see N72-28376 19-13)

The CNES program for the years 1970 and 1971 on remote sensing of earth resources in France is presented. Criteria for selection of sensors, sites, and periods are reviewed. Results obtained during a stratospheric balloon flight are given. Remote sensing techniques are evaluated for the visualization of water movements, which are important in water pollution detection, and for vegetation and soil studies. ESRO

N72-28378 Centre National d'Etudes Spatiales, Bretigny-sur-Orge (France).
AIRCRAFT AND BALLOON BORNE EXPERIMENTS [LES EXPERIENCES AVION ET BALLON]
L. Laidet *In its* Remote Sensing of Earth Resources Oct. 1971 p 7-32 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

Fundamental principles of remote sensing techniques are recalled, and experiments using aircraft or stratospheric balloon photography and infrared scanning are summarized. The instruments used in both imaging techniques are described, and the data processing procedures are outlined. The results from aircraft remote sensing of different French sites are reported. ESRO

N72-28379 Societe Europeenne de Propulsion, Puteaux (France).
BALLOON NACELLE FOR HIGH ALTITUDE PHOTOGRAPHY [NACELLE BALLON POUR PHOTOGRAPHIE A TRES HAUTE ALTITUDE]
L. Salter *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 33-41 In FRENCH (For availability see N72-28376 19-13)

The nacelle is described, designed for the balloon used for small scale scanning and multispectral photometry of the ground during the April 1971 flight. Special attention is paid to onboard equipment, including devices for automatic adjustment of photographic lens diaphragms and multispectral photomultiplier photometers. The calibration methods are reviewed. It is shown that balloon sounding is useful as the preliminary stage in the development of an earth resources satellite. ESRO

N72-28380 Institut National de la Recherche Agronomique, Paris (France). Service d'Etude des Sols et de la Carte Pedologique de France.
SOIL ANALYSIS FROM CNES SUMMER AND WINTER 1970-71 MISSIONS: PAYS DE BRAY SITE [ANALYSE PEDOLOGIQUE DES MISSIONS CNES ETE ET HIVER 1970-71: ZONE DU PAYS DE BRAY]
M. Isambert *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 50-58 Original contains color illustrations (For availability see N72-28376 19-13)

Aerial photographs taken during July 1970 and February 1971 are interpreted for four different photographic emulsions. Results obtained from Cyclope scanner measurements are presented, and it is shown that due to Cyclope scanner thermal resolution limitations, the black and white photographic emulsions are the most suitable for study of the Pays de Bray area. ESRO

N72-28381 Institut National de la Recherche Agronomique, Paris (France).
SOIL ANALYSIS FROM CNES SUMMER AND WINTER 1970-71 MISSIONS: VAL DE LOIRE - SOLOGNE SITE [ANALYSE PEDOLOGIQUE DES MISSIONS CNES ETE ET HIVER 1970-71: ZONE VAL DE LOIRE -- SOLOGNE]
P. Horemans *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 59-70 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

The aerial photographs taken during the July 1970 and February 1971 flights are interpreted for four different photographic emulsions. Results obtained from the Cyclope scanner measurements are presented, and it is shown that winter is the most favorable period for mapping the soil surface of Val de Loire by means of aerial photographs. The use of the Cyclope scanner, which gives thermal and hydrological information on the depth of the analyzed terrain, is emphasized. ESRO

N72-28382 Institut National de la Recherche Agronomique, Paris (France). Station Centrale de Bioclimatologie.
SURVEILLANCE OF AGRICULTURAL ZONES BY REMOTE SENSING [SURVEILLANCE DES ZONES DE GRAND CULTURE PAR TELLEDETECTION]
A. Perrier and P. Chartier *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 71-85 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

The reflection diffusion of electromagnetic waves by flowers, fruits, and foliage in the range from 0.4 to 3 microns range, and the emission of thermal radiation peculiar to each species in the range from 3 to 40 microns are studied. Results obtained from aerial IR photographs of species differentiation, surface homogeneity, effect of soil humidity, and irrigation are interpreted. The techniques for quantitative analysis are also assessed. ESRO

N72-28383 Institut National de la Recherche Agronomique, Paris (France). Station de Recherches Forestieres.
PARASITIC DAMAGE DETECTION IN THE MAURES, ESTEREL AND LANDES MARITIME PINE FORESTS [DETECTION D'ATTAQUES PARASITAIRES EN FORETS DE PINS MARITIMES DANS LES MAURES, L'ESTEREL ET LES LANDES]
J. Riom, J. P. Fabre, A. Boulbria, and B. Gerbinot *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 86-87 In FRENCH (For availability see N72-28376 19-13)
(Contract DGRST-71-7-2624)

Different methods of detecting pine forest diseases caused by Matsucoccus feytaudi attack are briefly presented. It is shown that the best results are obtained with false color photographic emulsions. ESRO

N72-28384 Institut National de la Recherche Agronomique, Paris (France). Station de Biocenotique et de Lutte Biologique.
EVIDENCE OF EXTINCTION OF THE BEECH IN THE LYONS FOREST (EURE) FRANCE [MISE EN EVIDENCE DU DEPERISSEMENT DU HETRE EN FORET DE LYON (EURE) FRANCE]
C. B. Malphettes *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 88-94 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

The method for detecting beech tree diseases in the Lyons forest, caused by Cryptococcus fagi insects and Nectria fungi, is described. Results obtained from aerial photographs are interpreted. It is shown that the difference in colors of photographs enables classification of damaged trees into categories. It is concluded that remote sensing is a useful qualitative technique for the approach to the beech extinction problem in upper Normandy. ESRO

N72-28385 Centre National d'Etudes Spatiales, Montpellier (France). Centre d'Etudes Phytosociologiques et Ecologiques.
IS REMOTE SENSING OF NATURAL AND ARTIFICIAL

ECOSYSTEMS JUSTIFIED AND POSSIBLE? [LA TELEDETECTION DES ECOSYSTEMES NATURELS ET ARTIFICIELS EST-ELLE JUSTIFIEE ET POSSIBLE?]
G. Long, G. Rimbault, and J.-L. Guillerm *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 95-123 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

An approach to the study of the biosphere is proposed that gives priority to investigations of the autotrophic vegetation, the first link in the food chain. It is shown that an ecological study in depth of the vegetation may explain the mechanisms that have led to the present humanized landscape of the vegetation cover in Europe. ESRO

N72-28386 Bureau pour le Developpement de la Production Agricole, Paris (France).
CONTRIBUTION OF AIRBORNE INFORMATION TO THE TECHNIQUES OF RURAL PLANNING: RESULTS OF 1970-1971 WORK [CONTRIBUTION DE L'INFORMATION AEROPORTEE DANS LE CADRE DES TECHNIQUES D'AMENAGEMENT DE L'ESPACE RURAL: RESULTATS DES TRAVAUX 1970-71]
Pierre Leroux *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 124-138 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

An approach to the analysis of Cernay-la-Ville and Bricy Arthenay terrains by means of remote sensing is proposed, and results of different airborne techniques discussed. They include photographic recording, using four different emulsions, and thermal recordings. Advantages of using infrared photography are shown. The optima periods for remote sensing are chosen. Results obtained from stratospheric balloon recordings are discussed. ESRO

N72-28387 Centre National de la Recherche Scientifique, Toulouse (France). Service de la Carte de la Vegetation.
REMOTE SENSING OF VEGETATION LANDSCAPES [TELEDETECTION DES PAYSAGES VEGETAUX]
P. Rey *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 139-148 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

Results obtained from remote sensing techniques applied to vegetation terrain analysis are interpreted. They include aerial photographs of the Minervois de L'Aude and de L'Herault, Pays de Bray, and Val de Loire regions, thermographic data on the same regions, and data on the Acquitaine and Adour regions. The different techniques are evaluated. ESRO

N72-28388 Ecole Nationale Superieure Agronomique, Grignon (France).
AERIAL PHOTOGRAPHS AND AGRICULTURAL ECOLOGY: ECOLOGICAL STUDY OF THE RAMBOUILLET FOREST [PHOTOGRAPHIES AERIENNES ET ECOLOGIE AGRICOLE: ETUDES ECOLOGIQUES DANS LA FORET DE RAMBOUILLET]
C.-M. Girard *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 149-174 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

Aerial photography is applied to agricultural species differentiation, determination of soil influence on crops and cropage, and chemical weed-killing zone detection. The detection of a vegetation accident in an oatfield is emphasized. Some vegetation ecological problems in the Rambouillet forest, France were studied using aerial photographs with different photographic emulsions. They include: tree species identification, the equilibrium between two sandy moor species, the localization of tree species, tree evolution, and Pinus sylvestris reforestration on a humid moor. ESRO

N72-28389 Ecole Nationale Superieure Agronomique, Grignon (France).
STUDY OF SOIL AND CROPS IN THE GRIGNON EXPERIMENTAL FIELDS [ETUDE DES SOLS ET DES FACONS CULTURALES SUR LES PARCELLES EXPERIMENTALES DE GRIGNON]
M.-C. Girard *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 175-188 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

Results obtained from aerial photographs of the Grignon experimental fields on 5 March 1971 are presented. The terrain was analyzed and different ploughing zones were determined by means of color differentiation. Old and new Canadian ploughing zones were determined. ESRO

N72-28390 Bureau de Recherches Geologique et Minieres, Paris (France). Service Photogeologie.
POSSIBILITIES OF APPLYING NEW REMOTE SENSING TECHNIQUES TO GEOLOGY AND HYDROLOGY [POSSIBILITES D'UTILISATION DES TECHNIQUES NOUVELLES DE LA TELEDETECTION EN GEOLOGIE ET EN HYDROGEOLOGIE]
J.-Y. Scanvic and G. Weecksteen *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 189-217 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

Results obtained from remote sensing techniques applied to terrain analysis of Pays de Bray, Beauce, Val de Loire, La Ciotat, and Minervois de l'Herault are presented. They include results from aerial photographs using different photographic emulsions, and from infrared scanning. The hydrological and geological data are analyzed, and both techniques are compared. ESRO

N72-28391 Paris Univ., Orsay (France). Lab. of Petrology-Volcanology.
CONTRIBUTION OF AIRBORNE INFRARED SENSING TO THE STUDY OF ERUPTIVE TERRAINS (CHAINE DES PUYS, BANNE D'ORDANCHE, AGDE) [CONTRIBUTION DE LA DETECTION AEROPORTEE DANS L'INFRAROUGE A L'ETUDE DE TERRAINS ERUPTIFS (CHAINE DES PUYS, BANNE D'ORDANCHE, AGDE)]
S. Paul *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 218-245 In FRENCH (For availability see N72-28376 19-13)

Results from infrared photographs taken during an earth resources technology aircraft survey of the nonactive volcanic terrains of Chaine des Puys, Banne d'Ordanche, and Adge (France) are presented and discussed. The flights were made during summer 1970, winter 1971, and spring 1971. The photointerpretation revealed a thermal anomaly at the Aydat Lake surface. It is concluded that a very high resolution scanning can be obtained by airborne detection of far infrared radiation emission in volcanic regions. ESRO

N72-28392 Institut Francais du Petrole, Paris (France).
POSSIBILITIES OF DIGITAL IMAGING TECHNIQUES AND SURFACE REPRESENTATION [QUELQUES POSSIBILITIES DE TRAITEMENT NUMERIQUE ET DE REPRESENTATION DE SURFACE]
A. Fontanel and C. Hemon *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 246-275 refs In FRENCH; ENGLISH summary (For availability see N72-28376 19-13)

Various types of digital techniques used to process remote sensing recordings are described. They include: deconvolution to improve resolution; and directional filtering to eliminate (or enhance) a previously chosen range of directions. An example is given which shows how contour can be automatically determined from a seismic recording. Possibilities of multispectral recording are considered, and an example is given of side-scanning sonar image data compression. Some examples of computer printout are given. ESRO

N72-28393 Ecole Nationale Superieure du Petrole et des Monteurs, Rueil-Malmaison (France).
OPTICAL PROCESSING OF THERMOGRAPHS [TRAITE-

MENT OPTIQUE DES THERMOGRAPHIES]
P. Boissard *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 276-306 refs In FRENCH (For availability see N72-28376 19-13)

Aerial thermographs of the Minervois de l'Herault terrain done during summer 1970 are interpreted. Spatial filtering was applied to the thermographs. The optical density of the pictures was studied by an isodensitometric method. A method for correcting the picture deformations is presented. The advantages of this optical processing method and its application to the processing of aerial images recorded by other techniques are stressed. ESRO

N72-28394 Ecole Nationale Superieure du Petrole et des Monteurs, Rueil-Malmaison (France).
INTERPRETATION OF MINERVOIS DE L'HERAULT THERMOGRAPHS [INTERPRETATION DES THERMOGRAPHS DU MINERVOIS DE L'HERAULT]
C. Torres *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 307-341 In FRENCH (For availability see N72-28376 19-13)

Results obtained from aerial thermographs of the Minervois l'Herault terrain are compared with results from aerial photographs of the same site using four photographic emulsions and interpreted using ground based terrain verifications. The advantages of using remote thermographs are demonstrated. It is concluded that both remote thermography and aerial photography are required for soil mapping and terrain analysis. ESRO

N72-28395 Ecole Nationale Superieure du Petrole et des Monteurs, Rueil-Malmaison (France).
SOME EXAMPLES OF THE MINERVOIS DE L'HERAULT CARTOGRAPHY [DIVERS EXEMPLES DE CARTOGRAPHIE SUR LE MINERVOIS]
M. Guy *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 342-355 refs In FRENCH (For availability see N72-28376 19-13)

The methodology for processing of geological data obtained from remote sensing of the Minervois de l'Herault test zone is presented. Results were obtained concerning the optimal dates for scanning of this area. ESRO

N72-28396 Strasbourg Univ. (France). Centre de Geographie Appliquee.
INTEGRATED STUDY OF THE ECOLOGICAL MILIEU USING REMOTE SENSING IMAGES [L'ETUDE INTEGREE DU MILIEU ECOLOGIQUE AU MOYEN D'IMAGES DE TELEDETECTION]
J. Tricart and G. J. Lutz *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 356-376 In FRENCH (For availability see N72-28376 19-13)

Results obtained from remote sensing of the Saint-Pons site are summarized, and the methodology for interpretation of data is presented. It includes object identification of the images followed by ground based data correlation with remote sensing data from infrared imagery and thermographic measurements. Results on the lithology, hydrology, and vegetation cover are reported. ESRO

N72-28397 Montpellier Univ. (France). Centre d'Etude et de Recherches Hydrologiques.
FIRST RESULTS OF A REMOTE SENSING STUDY OF THE LANGUEDOC COAST PONDS [PREMIERS ENSEIGNMENTS D'UNE ETUDE PAR TELE-DETECTION DES ETANGS COTIERS LANGUEDOCIENS]
G. Armangau *In* CNES Remote Sensing of Earth Resources Oct. 1971 p 377-422 In FRENCH Original contains color illustrations (For availability see N72-28376 19-13)

Some remote sensing techniques for vegetation, human activities, and water dynamics studies are presented. They invlude aerial multispectral photography, Cyclope infrared scanner, and the LHD infrared radiometer. The results obtained using all three methods are compared and discussed. Remote sensors for the investigation of coastal ecology is emphasized. ESRO

N72-28398# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Jun. 1971 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, JUIN 1971]
Jun. 1971 27 p In FRENCH and DUTCH
Avail: NTIS HC 43.50

Geophysical data obtained at Dourbes, Belgium are presented. These relate to geomagnetism, air radioactivity, ionospheric parameters, seismology, atmospheric electricity, and cosmic rays during June 1971. ESRO

N72-28399# Geological Survey, Washington, D.C.
ACOUSTIC REFLECTION PROFILES: WESTERN CONTINENTAL MARGIN. GULF OF MEXICO
L. E. Garrison, Erk Reimnitz, and R. G. Martin 1972 96 p refs Prepared in cooperation with Univ. Nacl. Autonoma de Mex., Villa Obregon
(PB-207593; USGS-GD-72-001) Avail: NTIS HC $3.00 CSCL 08G

The report releases unedited copies of subbottom acoustic reflection profiles along approximately 4,000 km of track line across the continental shelf and upper slope between Corpus Christi, Texas and Campeche, Mexico. The survey was conducted aboard the Mexican Navy research vessel Cadete Virgilio Uribe. The geophysical equipment and supplementary navigational gear were supplied by the U.S. Geological Survey. The geological setting, preliminary results, and types of equipment used are described. Author (GRA)

N72-28400# Geological Survey, Menlo Park, Calif.
PROGRAM PROFL 3: A GENERALIZED PROFILE PLOTTING PROGRAM
A. Graig McHendrie Feb. 1972 53 p refs
(PB-207523; USGS-GD-72-014) Avail: NTIS HC $3.00 CSCL 08B

PROFL3 is a FORTRAN 4, level G, program which will plot generalized profiles using an IBM 360/65 computer and a Benson-Lehner incremental plotter. Data points are plotted along a horizontal time axis and against vertical value axes. Two different vertical axes can be drawn with different scales and ranges, and up to three different data types can be plotted on one diagram. A special bathymetry axis which maintains the proper sense of topograhic relief can be used to plot positive values for depth below sea level. Options exist to draw time increasing from left to right or right to left, to draw a continuous line through the points of a specified value type, and to draw dashed, horizontal lines through the origins of the vertical axes. Each profile is fully annotated with the profile name, the value types and their respective symbols, the starting and ending times and the vertical axes' names and scales. Author (GRA)

N72-28401# Geological Survey, Washington, D.C.
THE APPLICATION OF GEOCHEMICAL, BOTANICAL, GEOPHYSICAL, AND REMOTE SENSING MINERAL PROSPECTING TECHNIQUES TO TROPICAL AREAS STATE OF THE ART AND NEEDED RESEARCH
John Van N. Dorr, II, Donald B. Hoover, Terry W. Offield, and Hansford T. Shacklette Dec. 1971 103 p refs
(Grant PASA-TA-(IC)-9-72)
(PB-207191) Avail: NTIS HC $3.00 CSCL 08G

A preliminary study is presented on the development of geophysical, geochemical, and geobotanical mineral prospecting techniques for application in tropical areas, both humid and arid. Each technique is discussed as to the state of the art, instrument and survey costs, research gaps and priorities. An analysis is made of the developing countries' capability to use the results of successful research and likely economic payoff. Author (GRA)

N72-28402# Wisconsin Univ., Madison. Dept. of Computer Sciences.

A NUMERICAL APPROACH TO WIND-DRIVEN OCEAN CIRCULATION. APPENDIX: FORTRAN PROGRAM FOR WIND-DRIVEN CIRCULATION

Donald Greenspan and Alvan B. Schubert Mar. 1972 36 p refs

(PB-208235; WIS-CS-72-149) Avail: NTIS HC $3.00 CSCL 08C

A numerical method is developed for a wind-driven ocean circulation model. Examples of flow patterns of the northern Pacific, which include large nonlinear effects, are given.

Author (GRA)

N72-28403# Tiburon Marine Lab., Bureau of Sport Fisheries and Wildlife, Calif.

MEASUREMENTS OF SEA SURFACE TEMPERATURE ON THE EASTERN PACIFIC CONTINENTAL SHELF USING AIRBORNE INFRARED RADIOMETRY Oceanographic Report, Aug. 1963 - Jul. 1968

James L. Squire, Jr. Dec. 1971 237 p refs

(PB-208156; USCG373-47; Oceanog-47) Avail: NTIS HC $3.00 CSCL 08J

Airborne surveys were conducted monthly from August 1963 through July 1968, using an infrared radiometer to measure sea surface temperatures and to develop isotherm charts depicting temperature ranges for three areas of the eastern Pacific Continental Shelf. A total of 179 airborne surveys were conducted from aircraft. Sea surface temperatures determined by the monthly surveys are presented in contoured charts. Five-year mean sea surface temperatures for each of the three survey areas were determined for each calendar month of the year by 10-minute longitude by 10-minute latitude areas and isotherm charts were drawn from these data. Author (GRA)

N72-28404# California Univ., Berkeley.

PROPERTIES OF SEAWATER AND ITS CONCENTRATES AND RELATED SOLUTIONS AT TEMPERATURES UP TO 400 F Research and Development Progress Report

L. A. Bromley Feb. 1972 109 p refs

(Contract DI-14-30-2525)

(PB-208064; Int-OSW-RDPR-72-747) Avail: NTIS GPO HC $1.00 as SN-2400-0706 CSCL 08J

Heat capacity measurements are reported for NaCl, KCl, MgSO4, Na2SO4 and MgCl2 solutions. Tables of C(s), saturation heat capacity, and C (p), heat capacity at constant pressure, are shown for varying salinities and temperatures. Polynomial equations obtained from curve fitting are given for both sets of values. Heats of mixing for sea salt solutions are reported for 73 C. A limited number of experimental boiling point elevations of sea salt solutions between 80 and 120 C are reported. Kinematic viscosity values for sea salt solutions to 11% salinity between 0 and 150 C are reported. Author (GRA)

N72-28405# Massachusetts Inst. of Tech., Cambridge.

OCEANOGRAPHIC RESEARCH AT MIT IN THE DEPARTMENT OF EARTH AND PLANETARY SCIENCES AND THE DEPARTMENT OF METEOROLOGY Annual Report, 1 Jan. - 31 Dec. 1971

Robert C. Beardsley, John M. Edmond, Frank Press, Peter B. Rhines, Gene Simmons, John B. Southard, Henry M. Stommel, Charles G. Wing, and Carl I. Wunsch Mar. 1972 45 p refs

(Contract N00014-67-A-0204-0048; NR Proj. 083-157)

(AD-739749; Rept-72-2) Avail: NTIS CSCL 08/3

Contents: Ocean-island interaction; Ocean circulation model studies; Equatorial undercurrent observations in the Indian Ocean; Ocean bottom pressure fluctuations; Internal waves and tides in Massachusetts Bay; Internal waves and currents; Marine gravity; Mechanics of bottom sediment movement; Trace element geochemistry; Multiple geophysical tests of models of the spreading sub-oceanic lithosphere; Deep ocean magnetotelluric program elastic waves project. GRA

N72-28406# Aeronautical Chart and Information Center, St. Louis, Mo.

STANDARD PRINTING COLOR IDENTIFICATION SYSTEM

Otto C. Stoessel and John V. Loser Feb. 1972 28 p

(AD-739971; ACIC-TR-72-2) Avail: NTIS CSCL 14/5

The Department of Defense - Mapping, Charting, and Geodesy (DOD-MC-G) Color Identification System for Lithographic Printing is broad enough in scope to include and catalog all colors in a logical, orderly arrangement. Under this system, lithographic colors are assigned numbers which are descriptive of the color values. The system is based on international values as seen by an international standard observer and illuminant. The CIE description of color is applied as the basis for color identification. This report also describes the means of applying color values to an ink formulation and specification system for the manufacture/blending of color matched lithographic inks. The ink formulation is based on using eight basic colors plus black and white. Blending these in specified parts can produce virtually all ink colors. Author (GRA)

N72-28407# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

COMPARISON OF ELECTRON FLUXES WITH THE WHISTLER SELF-EXCITATION LIMIT DURING A MAGNETIC STORM

Paul L. Rothwell 21 Jan. 1972 15 p refs

(AF Proj. 8600)

(AD-739887; AFCRL-72-0086; AFCRL-ERP-386) Avail: NTIS CSCL 04/1

The measurements from a magnetic spectrometer flown on board Air Force satellite OV1-13 during the magnetic storm of 9 June 1968 show that a large number of 115- and 180-keV electrons were injevted into the outer radiation belt and remained there throughout the storm period. It is shown that these fluxes are consistent with an equatorial energy spectrum in which 40-keV electrons were at their whistler self-excitation limit. It is suggested that the whistlers played a role in the observed enhancement of MeV electrons off the equator.

Author (GRA)

N72-28408# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

RADIO MAPPING OF 250 TO 925 MHz NOISE SOURCES IN CLOUDS Interim Report

Richard B. Harvey and Edward A. Lewis 7 Jan. 1972 26 p refs

(AD-739886; AFCRL-72-0078; ERP-383) Avail: NTIS CSCL 04/1

Directional antennas at Cape Kennedy were used to passively detect radio noise emitted by storm clouds in the 100 to 1000 MHz spectral region. With the antenna programmed to automatically raster-scan an area of the sky, a slaved display provided a picture or map of the electrical activity. A number of such pictures are shown, including a sequence indicating high-altitude electrical activity in a tornado-producing thunderstorm. Author (GRA)

N72-28409# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

DEVELOPMENT OF THE PROCESS OF PRE-CONSTRUCTION THAWING AND CONSOLIDATION OF PERMAFROST

V. F. Zhukov and I. I. Frolov Apr. 1972 13 p refs Transl. into ENGLISH from Sb. Tr. Nauch.-Issled. Inst. Osnovanii i Podzemnykh Sooruzhenii (Moscow), no. 50, 1962 p 72-79

(AD-739958; CRREL-TL-338) Avail: NTIS CSCL 08/12

The article includes materials obtained from observations (1960) of the development of thawing and consolidation of a thawing base during the pre-construction electric heating and electrical-osmotic compaction conducted at Vorkuta in the experimental construction of an apartment building.

Author (GRA)

N72-28410# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

DESIGN OF FOUNDATION BEDS ON THAWING GROUND ACCORDING TO DEFORMATIONAL LIMITS

V. P. Uskalov Apr. 1972 14 p Transl. into ENGLISH from the Monograph "Trudy Soveshchaniya po Ratsionalnym Sopsobam Fundamentostroeniya na Vechnomerzlykh Gruntakh" Moscow, 1959 p 27-36

(AD-739959; CRREL-TL-331) Avail: NTIS CSCL 08/13

The new method for estimating the thawing beds according to deformational limits has considerable practical importance because it expands greatly the limits of using soils as natural footings, taking into account their combined functioning with the design of structures; it permits one to plan buildings and structures on such greatly compressed and settling soils as the thawing frozen soils, loess-like settling, filling, silty etc., where previously extensive use was made of expense artificial footings. Author (GRA)

N72-28411# Joint Publications Research Service, Washington, D.C.

DENSITY OF SANDY GROUND

M. F. Kiselev Apr. 1972 5 p Transl. into ENGLISH from Promyshlennoe Stroitelstvo (USSR), v. 32, no. 11, Nov. 1954 p 41-42 Prepared for Army Cold Regions Res. and Eng. Lab., Hanover, N. H.

(AD-739960; CRREL-TL-339) Avail: NTIS CSCL 08/13

At the contemporary stage in the development of construction technology, with the disappearance of seasonal interruptions in construction projects, the necessity is arising more and more often of estimating the degree of friability and settling tendency of frozen sandy soils in excavations. The procedure discussed in the report permits one to accomplish such an estimation. GRA

N72-28412# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

EXPERIMENTAL METHODS OF DETERMINING THE SETTLING OF PERMANENTLY FROZEN SOILS ON THAWING

G. V. Porkhaev and S. G. Tsvetkova Apr. 1972 9 p refs Transl. into ENGLISH from TR. Akad. Nauk SSSR, Inst. Merzlotovedeniya (USSR), v. 14, 1958 p 64-69

(AD-739961; CRREL-TL-340) Avail: NTIS CSCL 08/13

A procedure for determining the settlings of permanently frozen dispersed soils containing ice as a component has been developed for samples of small sizes. In the studies and investigations, the settling of permanently frozen soils is conventionally determined with the aid of N.A. Tsytovich's odometer for samples ranging from 5-10 cm in diameter. The purpose of the studies described in the report is to compare the thermal settling (settlements on thawing without load) of permanently frozen soils of natural structure, such subsidence having been determined by laboratory and field methods. Author (GRA)

N72-28413# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

VARIATIONS IN THE POROSITY OF FROZEN GROUND PRODUCED BY THAWING

E. P. Shusherina Apr. 1972 21 p refs Transl. into ENGLISH from Materialy po Lab. Issled. Merzlykh Gruntov (USSR), no. 1, 1953 p 118-134

(AD-739962; CRREL-TL-341) Avail: NTIS CSCL 08/13

The experiments conducted with quartz sand, blanket loam and varved clay fully confirm the theory previously expressed by N.A. Tsytovich concerning the rectilinear dependence between the variation in porosity factor and the value for pressure on soil during thawing. Author (GRA)

N72-28414# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

BASIC REGULARITIES GOVERNING COMPRESSIBILITY THAWING GROUND UNDER PRESSURE

V. P. Ushkalov 1971 15 p refs Transl. into ENGLISH from Proc. of 8th All-union Interdept. Conf. on Geocryology and Permafrostology, 1966

(AD-739952; CRREL-TL-328) Avail: NTIS CSCL 08/13

The author presents experimental data obtained while investigating the title problem. GRA

N72-28415# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

CALCULATION OF GROUND THAWING ALLOWING FOR WATER SEEPAGE

G. M. Feldman Apr. 1972 14 p refs Transl. into ENGLISH from Nauchno-Issled. Inst. Stroit. Stroit. Raionakh Vost. Sibiri Krainego Severa (USSR), no. 12, 1969 p 131-144

(AD-739954; CRREL-TL-334) Avail: NTIS CSCL 08/13

The nature of the heat exchange of the filtration flow of frozen soil depends significantly on the filtering properties of this soil in a frozen state. Two possible cases are studied: the soil pores are filled with ice or not (open pores). Author (GRA)

N72-28416# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

CHANGES IN SOIL PROPERTIES ON FREEZING AND THAWING

N. A. Tsytovich, G. A. Martynov, E. P. Shusherina, and B. N. Dostovalov 1971 33 p refs Transl. into ENGLISH from Mater. po Lab. Issled. Merzlykh Gruntov (USSR), no. 3, 1957 p 84-114

(AD-739953; CRREL-TL-329) Avail: NTIS CSCL 08/13

Frozen soils, particularly the dispersed ones, are extremely susceptible to external influences. The slightest changes in the value of their negative temperature or chemical composition of water, variations in external pressure, etc. are reflected significantly on the frozen soils' properties. The report discusses the following topics: Effect of freezing on certain physical and physico-mechanical properties of soils; Effect of thawing on variation in frozen soils' properties; Variation in physico-mechanical properties of soils as a result of a freeze-thaw cycle. GRA

N72-28417# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

DETERMINING THE TYPE OF GROUND AND ITS CONDITIONS ACCORDING TO SETTLEMENT

V. V. Kovalenko and F. G. Shishkanov Apr. 1972 18 p refs Transl. into ENGLISH from Nauchno-Issled. Inst. Stroit. Stroit. Raionakh Vost. Sibiri Krainego Severa.(USSR), no. 12, 1969 p 187-209

(AD-739955; CRREL-TL-335) Avail: NTIS CSCL 08/13

In the report, the authors have evaluated the methodology used for establishing the relative subsidence based on two curves and at varying pressures; recommendations have been given increasing the reliability of determining the parameters for the settling-type soils of Eastern Siberia. Author (GRA)

N72-28418# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

STUDYING THE SETTLING OF FROZEN GROUND ON THAWING

E. P. Shusherina Apr. 1972 15 p refs Transl. into ENGLISH from Materialy po Lab. Issled. Merzlykh Gruntov, Akad. Nauk SSSR, Inst. Merzlotovedeniya (USSR), no. 2, 1954 p 138-150

(AD-739956; CRREL-TL-336) Avail: NTIS CSCL 08/13

The settling of frozen soils on thawing occurs as a result of the conversion of the ice contained in it to water. As a rule, the thawing of frozen soils is accompanied by the pressing out of water forming at this time and a reduction in the soil's porosity, which also directly causes the settling. In the present report, a technique for determining the settling of frozen ground on thawing with the aid of N. A. Tsytovich's odometer is described. In this device, a determination is made of the settling of frozen ground during uniform unilateral (from above) thawing under the

effect of vertical, evenly distributed load with the possibility of lateral expansion of the soil and at a given temperature regime of the heating punch. The pressing out of the water forming during the ice's thawing in frozen soil sample occurs only in one direction (upward). Author (GRA)

N72-28419# SACLANT ASW Research Center, La Spezia (Italy).
LAYERED OCEANIC MICROSTRUCTURE, ITS EFFECTS ON SOUND PROPAGATION
Ola M. Johannessen and Leonard E. Mellberg 1 Feb. 1972 36 p refs
(AD-740052; SACLANTCEN-TR-206) Avail: NTIS CSCL 08/10

It has recently been established that the vertical profiles of oceanographic parameters in the seasonal and permanent thermocline regions are not the smooth curves observed by older techniques. Rather they indicate a large number of nearly homogeneous layers, with typical thicknesses of metres or less, separated by interfacial regions where strong gradients exist. Examples of typical layered microstructure profiles from different ocean areas are presented. The effects of such microstructure on sound propagation are examined qualitatively using ray tracing techniques. It was found that the layered microstructure had a significant effect only when rays vertex within the layers; in which case the iso-intensity-loss contours degenerate into a broad scatter of points. Author (GRA)

N72-28420# Aeronautical Chart and Information Center, St. Louis, Mo.
GEODETIC APPLICATION OF SATELLITE DATA
Thomas C. Seppelin Apr. 1971 25 p Presented at 8th Space Congr., Cocoa Beach, Fla.
(AD-738332; ACIC-Tech-Paper-71-1) Avail: NTIS CSCL 08/5

The Aeronautical Chart and Information Center has used the data obtained from the Geodetic Satellite Program in a number of ways. The investigations are divided into two separate categories which support the development of a World Geodetic System both directly and indirectly. The geometric application has been specific point positioning for the Test Ranges and the densification of geodetic control in South America. The dynamic application has been concerned primarily with determination of an earth gravitational model and tracking station locations from a combination of optical and electronic data supplemented with existing surface gravity anomalies. The status of the various efforts is presented. Author (GRA)

N72-28421# Ballistic Research Labs., Aberdeen Proving Ground, Md.
MEASURING 557.7 nm AIRGLOW CHANGES ASSOCIATED WITH UPPER ATMOSPHERIC ION CLOUD RELEASES
Aivars Zolins Mar. 1972 17 p refs
(DA Proj. 1T0-61102-B-53-A)
(AD-739920; BRL-MR-2156) Avail: NTIS CSCL 04/1

Ground-based airglow measurements at 557.7 nm were conducted during the SECEDE II barium cloud releases to gather information on a proposed coupling between the ion clouds and the E-layer through charge transport. The twilight background signal at release time was found to be too large for the measuring the small effect with the available equipment. After the tests the field data were used in an instrument performance study. The results of this study will be useful in designing equipment for future measurements of this type. Author (GRA)

N72-28422# Aerospace Corp., El Segundo, Calif. Lab. Operations.
THE POLAR THERMOSPHERE, VOLUME 1 Research Report, 1 Jul. 1970 - 10 Feb. 1972
Stephen P. Creekmore, Edward L. Brieg, Barbara K. Ching, and Yam T. Chiu 1 Mar. 1972 166 p refs
(Contract F04701-71-C-0172)
(AD-739928; TR-0172(2260-20)-13-Vol-1; SAMSO-TR-72-61-Vol-1) Avail: NTIS CSCL 04/1

One- and three-dimensional models were constructed of the earth's thermosphere from 120-500 km in altitude. A significant advancement over previous work was accomplished by the use of novel mathematical methods to treat time variability, winds and the momentum equation, which are often approximated or neglected in such studies. Heating and cooling studies were performed using representative heating deposition profiles for EUV and geomagnetic heating. These studies elucidate reaction times and intensities as functions of heat deposition parameters. The one-dimensional model results have been compared with those of Mahoney, Thomas, and Thomas-Ching. In addition to the modeling studies, various advanced studies were conducted of heat deposition and energy transport, in order to provide a sound physical basis for future improvements in the existing models. Author (GRA)

N72-28423# California Inst. of Tech., Pasadena. Earthquake Engineering Research Lab.
STRONG-MOTION EARTHQUAKE ACCELEROGRAMS. DIGITIZED AND PLOTTED DATA. VOLUME 2: CORRECTED ACCELEROGRAMS AND INTEGRATED GROUND VELOCITY AND DISPLACEMENT CURVES. PART A: ACCELEROGRAMS IIA001 THROUGH IIA020
Donald E. Hudson, A. Gerald Brady, Mihailo D. Trifunac, and A. Vijayaraghavan Sep. 1971 330 p refs
(Grant NSF GK-28098X)
(PB-208283; EERL-71-50-Vol-2-Pt-A) Avail: NTIS HC $6.00 CSCL 08K

Corrected accelerations are presented, incorporating a baseline correction and an instrument correction, together with integrated ground velocity and displacement curves. These corrections are for improved seismic wave measurement. These corrections serve as input data for structural response calculations and for response spectrum determinations. Digitization and processing techniques are also discussed. Author (GRA)

N72-28424# Defense Documentation Center, Alexandria, Va.
OIL SLICKS AND FILMS Report Bibliography, Sep. 1961 - Mar. 1971
Mar. 1972 70 p refs
(AD-738500; DDC-TAS-71-64) Avail: NTIS CSCL 13/2

References pertaining to the cleaning and removal of oil slicks, oil films, and related films from sea surfaces, or water surfaces have been compiled in the bibliography. Included are Corporate Author-Monitoring Agency, Subject, Title, and Personal Author Indexes. Author (GRA)

N72-28425# Utah State Univ., Logan. Electro-Dynamics Labs.
AIRCRAFTBORNE INSTRUMENTATION FOR AIRGLOW SURVEY Final Report, 15 Nov. 1970 - 14 Dec. 1971
Allan J. Steed and Ralph H. Haycock 14 Dec. 1971 19 p
(Contract F19628-71-C-0081; AF Proj. 5710)
(AD-739196; AFCRL-71-0594) Avail: NTIS CSCL 04/1

The Electro- Dynamics Laboratories of Utah State University has modified the AFCRL trainable-instrumentation mount originally fabriated by Cook Electric Company so that it can be used as a tracking platform for two Type- III interferometers and one radiometer. The modification basically involved the addition of vibration isolation mounts and an enclosure with temperature control for the entire system which will be mounted in a KC-135 aircraft 3120. A dual-channel radiometer was designed and fabricated to fit in the remaining available mount space after the two interferometers had been installed. In connection with the radiometer design, an existing AFCRL radiometer originally built by GCA was evaluated to determine its usefulness in making airglow measurements. In addition to the Cook mount modifications, a manually trainable mount was fabricated to incorporate one interferometer, one radiometer and a 16-mm camera. Also, an NIR radiometer was modified to be used for hand-operated tracking and the rapid-scan spectrometer was updated to increase its sensitivity and reduce its noise level. Author (GRA)

N72-28426# Teledyne Geotechnical, Garland, Tex.
ALASKAN NOISE FIELD INVESTIGATION, MARCH - JUNE 1971
17 Jan. 1972 56 p refs
(Contract F33657-70-C-0646; ARPA Order 1714)
(AD-739175; TR-71-22) Avail: NTIS CSCL 08/11

Noise in the 50-60 second period range, recorded by the Alaskan Long-Period Array during the winter months, was found to be caused by convection cells within the array boreholes. A technique for preventing formation of the cells was devised. Burial of ALPA seismometers was found to significantly reduce wind-generated horizontal seismic noise. Relationships between triaxial module pressure sensitivities and module installation techniques and between pressure sensitivity and module tilt were studied. Author (GRA)

N72-28427# Delaware Univ., Newark.
RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT Annual Status Report, 1 Sep. 1970 - 31 Aug. 1971
William S. Gaither and Benjamin W. Howk Sep. 1971 22 p refs
(Contract N00014-69-A-0407; NR Proj. 388-096)
(AD-738930; CMS-3MD038) Avail: NTIS CSCL 08/3

Progress during the second year of a multi-disciplinary study of a section of the Atlantic seacoast (Delaware and adjacent areas of New Jersey and Maryland) is summarized. New knowledge of coastal geology and geologic history has been developed, and the properties of soils sediments in nearshore, beach, and backshore locations have been more fully determined. Continued theoretical investigations of wave action, model studies of sedimentary processes and underground water behavior, and the results of additional observations of vegetative growth and of surface energy exchanges are reported. Future objectives, particularly in the area of coastal zone remote sensing, are outlined. Author (GRA)

N72-28428# Hawaii Inst. of Geophysics, Honolulu.
PROCESSING OF AIRCRAFT EXPENDABLE BATHYTHERMOGRAPH DATA Final Report
Richard C. Latham and G. P. Woollard Aug. 1971 41 p
(Contract N00014-67-A-0387-0004)
(AD-738433; HIG-71-13) Avail: NTIS CSCL 08/10

The temperature profiles obtained by AXBT on a flight from Oahu to Kodiak on 18 March 1970 are presented together with the temperature section and the sound velocity section obtained by calculation using probable salinity values as derived from other sources. The resulting near-surface, short-range sound transmission conditions are described and their relative importance in the long-range transmission of sound is discussed. A detailed description is provided of the method which has been developed to plot temperature profiles from the magnetic tape record of AXBT drops with output accuracy of one-tenth degree C at each four m of depth. Author (GRA)

N72-28429# Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
STUDY OF AIRBORNE TWO-WAVELENGTH RADIOMETER SYSTEM FOR TOTAL HEAT-FLOW MEASUREMENTS Final Report, 29 Jun. 1968 - 9 Nov. 1971
E. D. McAlister and Theodore D. Foster Nov. 1971 6 p refs
(Contract N62306-68-C-0258)
(AD-740092) Avail: NTIS CSCL 08/10

A two-wavelength radiometer system has been developed for measurement of the total heat flow through the sea surface from a low flying aircraft. The heat transfer in the top millimeter of the ocean was investigated theoretically and in the laboratory. This work provided a sound basis for the two-wavelength radiometric method of measuring total heat flow from the sea surface. GRA

N72-28430# Sandia Labs., Livermore, Calif.
AN AIR DROPPED SEA ICE PENETROMETER
C. W. Young and L. J. Keck Dec. 1971 96 p refs
(MIPR Z-70099-0-02552)
(AD-739991; SC-DR-71-0729) Avail: NTIS CSCL 08/12

An air dropped penetrometer has been developed for the U.S. Coast Guard to remotely measure the thickness of sea ice. The development program is described, and the test data and results of the Arctic test program are presented and discussed. The sea ice thickness in the vicinity of Thule Air Base, Greenland, and Alert, Canada, was measured by the penetrometers with an accuracy of plus or minus 3 inches (plus or minus 7.6 cm) during the April 1971 tests. Author (GRA)

N72-28431# New York Univ., N.Y. Dept. of Meteorology and Oceanography.
RADAR SATELLITE OCEANOGRAPHY AND OCEAN DYNAMICS Final Report, 1 Jul. 1970 - 1 Dec. 1971
Willard J. Pierson and Vincent Cardone Dec. 1971 96 p
(Contract N62306-70-A-0075)
(AD-739385) Avail: NTIS CSCL 08/3

The document contains reports on remote sensing of ocean surfaces by satellite radar radiometry. GRA

N72-28432# Iowa Univ., Iowa City. Inst. of Urban and Regional Research.
A STUDY OF ENVIRONMENTAL MONITORING AND INFORMATION SYSTEMS Final Technical Report, Sep. 1970 - Sep. 1971
James S. Gardner Jan. 1972 96 p refs
(Contract DAAK02-71-C-0035; DA Proj. 4A0-61102-B-52D)
(AD-739553; ETL-CR-72-1) Avail: NTIS CSCL 08/6

Environmental information has a variety of uses. The report emphasizes one such use: the monitoring and periodic description of environmental quality. Operational and planned schemes for environmental monitoring are briefly reviewed. The status of remote sensing or data collection is discussed in relation to pertinent environmental elements and variables. The attributes or variables by which the physical environment may be described are outlined along with a measure of human activities, land use. On the basis of the review, the organizational structure of an environmental information system is outlined and discussed. Author (GRA)

N72-28433# Coast Guard Academy, New London, Conn.
SEA ICE THICKNESS MEASUREMENTS USING SHEAR WAVE REFLECTIONS
George P. Vance, Daniel D. Benefield, and Dennis M. Egan Dec. 1971 96 p refs
(AD-739743; RDCGA-28-1) Avail: NTIS CSCL 08/12

Because of the lack of success in measuring sea ice thickness with normal acoustic means, a method utilizing shear waves or S waves was tried during the summer of 1971 off Point Barrow, Alaska. A 551 A Textronic oscilloscope and polaroid camera were used to record the signals received. Two Columbia High Capacity accelerometers were used for triggering the scope and obtaining the return signal. A three pound sledge-hammer impacting on a six inch diameter steel plate was used as the S wave source. Results were obtained in ice thicknesses from 7.0 feet to 21.0 feet thick. An average S wave speed in sea ice of 6.56 feet per millisec was used. In comparing the recorded signals with physically measured thicknesses, the average error was found to be 6.6%. Author (GRA)

N72-28452 Ohio Dept. of Highways, Columbus.
AN EXPERIMENTAL INVESTIGATION OF HIGHWAY SURVEYING AND MAPPING CONTROL EXTENSION BY TRILATERATION AND CONVENTIONAL TRAVERSE
Shuh-Chai Lee and Anatol Leo Belkin *In* NAS/NRC Aerial Surv. and Photogrammetry 1971 p 15-27 refs Sponsored by Comm. on Photogrammetry and Aerial Surv.; funded by the Federal Highway Admin. (For availability see N72-28449 19-14)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N72-28434 National Lending Library for Science and Technology, Boston Spa (England).
APPLICATION OF THE ELECTRON PROBE MICROANALYZER TO THE STUDY OF DIFFUSION IN CLADDING
G. Vallier, C. Pautet, M. Toitot, and P. Bastien 4 Apr. 1972 20 p Transl. into ENGLISH from Metaux (Corrosion-Ind.) (Seine-et-Oise), 1971 p 272-281 In ENGLISH and FRENCH
(NLL-Trans-746-1182-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The diffusion equations are briefly reviewed and an attempt is made to solve them for diffusion in clad composite. The amplitude of the diffusion profile and the heat treatment given the clad materials are discussed. Author

N72-28435 British Broadcasting Corp., Kingswood (England). Research Dept.
THE CALCULATION OF ELECTRONIC MASKING FOR USE IN TELECINE
F. A. Griffiths 1972 12 p refs
(BBC-1972/34) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Electronic masking provides a means whereby some of the defects in the reproduction of a scene by color motion picture photography may be compensated electronically when the film is scanned by television. A means of calculating the electronic masking required to ensure that the original film record of a scene is used to its best advantage in television presentation is described. Author

N72-28436* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SPHERICAL MEASUREMENT DEVICE Patent
Howard B. Miller and George E. Sweet, inventors (to NASA) Issued 11 Jul.-1972 4 p Filed 12 Feb. 1970 Supersedes N70-25677 (08 - 12, p 2209)
(NASA-Case-XLA-06683; US-Patent-3,675,332;
US-Patent-Appl-SN-10827; US-Patent-Class-33-1SA;
US-Patent-Class-33-75R) Avail: US Patent Office CSCL 14B

A device for determining the distance of a point within a sphere from the surface of the sphere is described. The device consists of an elevational wheel mounted on an azimuth wheel and a spherical protractor supported by the elevation wheel. A telescopic rod extending through the spherical protractor measures the desired distance. Angular location of the point may be accomplished by using a flat protractor mounted on the end of the measuring rod. P.N.F.

N72-28437* National Aeronautics and Space Administration, Washington, D.C.
CLEAR AIR TURBULENCE DETECTOR Patent
George G. Haroules, Wilfred E. Brown, III, Harold I. Ewen, Arthur E. Lilley, and Ralph D. Kodis, inventors (to NASA) Issued 23 May 1972 10 p Filed 19 Nov. 1969 Supersedes N70-20710 (08 - 08, p 1445)
(NASA-Case-ERC-10081; US-Patent-3,665,467;
US-Patent-Appl-SN-877990; US-Patent-Class-343-100ME;
US-Patent-Class-73-355; US-Patent-Class-325-363;
US-Patent-Class-343-112D) Avail: US Patent Office CSCL 14B

An apparatus for warning the pilot of an aircraft of a region of clear air turbulence is described. A multi-channel radiometric sensor mounted on the aircraft detects both the ambient temperature of the air and any temperature anomaly that is present along the forward flight path. In those cases where temperature anomalies are associated with the presence of a clear air turbulence region, the invention provides means for remotely sensing these temperature anomalies through the application of a radiometric technique. By the detection of difference temperatures between a minimum of two channels, the invention provides a means for indicating the existence of a temperature anomaly indicative of clear air turbulence region. The distance between the clear air turbulence region and the aircraft is determined by utilization of at least two observing frequencies which have known absorption coefficients of different values. Official Gazette of the U.S. Patent Office

N72-28438* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
METHOD OF MAKING SEMICONDUCTOR p-n JUNCTION STRESS AND STRAIN SENSOR Patent
Jimmie J. Wortman and Ralph R. Stockard, inventors (to NASA) Issued 22 Dec. 1970 4 p Filed 1 Aug. 1968 Continuation-in-part of US Patent Appl. SN-577548, filed 6 Sep. 1966
(NASA-Case-XLA-4980-2; US-Patent-3,549,435;
US-Patent-Appl-SN-763040; US-Patent-Class-148-187;
US-Patent-Appl-SN-577548) Avail: US Patent Office CSCL 14B

A method is described for making a rod of one type semiconductor material with a needle-like point at one of its ends and another type semiconductor material diffused into the surface of the rod at the other end to form a p-n junction at the needle-like point. The rod with the p-n is useful as a stress and strain sensor. Official Gazette of the U.S. Patent Office

N72-28439*# Oklahoma Univ. Research Inst., Norman.
DEVELOPMENT OF PIEZOELECTRIC SKIN FRICTION FORCE VECTOR TRANSDUCER FOR A HYPERSONIC WIND TUNNEL Final Report, 1 Aug. 1969 - 30 Nov. 1971
Seun K. Kahng May 1972 36 p refs
(Grant NGR-37-003-045)
(NASA-CR-127447) Avail: NTIS HC $4.00 CSCL 14B

A surface shear force transducer for use in impulse type hypersonic tunnels is described. Sensors are constructed of lead zirconate titanate composition piezoelectric ceramic materials. The diameter of the sensing diaphragm is 0.75 inches and overall transducer dimensions are 1.0 inch diameter and 0.625 inch height. Analysis of the tranducer is made to help design criteria and fabrication techniques. Discussions on design and fabrication techniques are presented as well as performance of transducers delivered. Author

N72-28440*# Geological Survey, Washington, D.C.
PRELIMINARY CATALOG OF PICTURES TAKEN ON THE LUNAR SURFACE DURING THE APOLLO 16 MISSION
R. M. Batson, K. B. Carson, V. S. Reed, and R. L. Tyner 19 May 1972 72 p
(NASA Order T-5874-A)
(NASA-CR-127635; USGS-IR-NASA-50) Avail: NTIS HC $5.75 CSCL 14E

A catalog of all pictures taken from the lunar module or the lunar surface during the Apollo 16 lunar stay is presented. The tabulations are arranged for the following specific uses: (1) given the number of a particular frame, find its location in the sequence of lunar surface activity, the station from which it was taken and the subject matter of the picture; (2) given a particular location or activity within the sequence of lunar surface activity, find the pictures taken at that time and their subject matter; and (3) given a sample number from the voice transcript listed, find the designation assigned to the same sample by the lunar receiving laboratory. Author

N72-28441*# General Dynamics Corp., San Diego, Calif.
MULTI-WIRE HIGH TEMPERATURE THERMOCOUPLE Patent Application

James H. Sleigh, Jr. and Donald E. Schwarzer, inventors (to NASA) Filed 31 May 1972 8 p Sponsored by NASA
(NASA-Case-LEW-10854-2; US-Patent-Appl-SN-258464) Avail: NTIS HC $3.00 CSCL 14B

A sheathed thermocouple probe is made by inserting an end of each of a pair of thermocouple wires into a cavity or passageway in a plug which is then compressed by swaging to squeeze the wires together. Some BeO beads are then strung on the thermocouple loads and the whole assembly inserted into a cylindrical tube or a sheath. One end of the sheath may be swaged onto the plug, if desired, and the ends may be closed by welding whether or not the plug is swaged into the sheath. NASA

N72-28442*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
NEW USE OF THIN FILM LIGHT DETECTOR Patent Application
Joseph Maserjian and George W. Lewicki, inventors (to NASA) Filed 31 May 1972 26 p
(Contract NAS7-100)
(NASA-Case-NPO-11432-2; US-Patent-Appl-SN-258152) Avail: NTIS HC $3.50 CSCL 14B

The new use of a metal-insulator-metal (MIM) structure having a thin film base and a thin film insulator is reported. This structure provides a sensitive light detector with or without a bias. The insulator provides a trapezoidal barrier instead of the Schottky barrier characteristic of a semiconductor layer between two metals. NASA

N72-28443*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMOCOUPLE TAPE Patent Application
Ralph D. Thomas, inventor (to NASA) Filed 17 May 1972 12 p
(NASA-Case-LEW-11072-2; US-Patent-Appl-SN-254323) Avail: NTIS HC $3.00 CSCL 14B

A thermocouple which may be rolled as a tape until needed and a method of making the tape are described. Thermoelectrically different metals are applied to a strip of electrically nonconductive material in longitudinally overlapping relationship. Apertures may be provided along the tape in the overlapping region at predetermined intervals. An adhesive material is applied to the side of the tape opposite the thermoelectrical metals either before or after the thermoelectric metals are deposited. The tape may be cut or torn to form a thermocouple device which is ready for application to a body whose temperature is to be monitored or measured. NASA

N72-28444# Ludwig-Maximilians-Universitat, Munich (West Germany). Meteorologisches Inst.
RADIOMETERS FOR OH-EMISSION STUDIES FROM ROCKETS
W. Bangert, E. Krieg, and R. Scheidle Bundesministerium fuer Bildung und Wiss. Apr. 1972 55 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Bildung und Wiss.
(BMBW-FB-W-72-07) Avail: NTIS HC $4.75; ZLDI Munich: 11.40 DM

Two radiometers are described which are developed for rocket borne measurements of the 2.8 micrometer (1-0 band) and 0.83 micrometer (6-2 band) OH-emission. Each of the radiometers measures in two spectral intervals, in the maximum of OH-emission and in a nearby region to determine the background emission. The 2.8 micrometer radiometer is cooled in order to suppress the mirror emission. Author

N72-28445# Ludwig-Maximilians-Universitat, Munich (West Germany). Meteorologisches Inst.
AN AIRBORNE EIGHT CHANNEL STEP-SCAN RADIOMETER
H.-J. Bolle and K. Th. Kriebel Bundesministerium fuer Bildung und Wiss. Apr. 1972 25 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Bildung und Wiss.
(BMBW-FB-W-72-13) Avail: NTIS HC $3.25; ZLDI Munich: 5.10 DM

An airborne spectral radiometer is described, which measures the radiances in eight channels simultaneously. The spectral bands are defined by exchangeable interference filters. Seven channels lie inbetween 0.4 and 3 microns, while one channel is designed for the thermal infrared near 11 micron. A programmed scanning mirror allows side-looking measurements in 10 degree steps. The FOV is 6 degrees, which gives an equivalent horizontal resolution from low flying aircrafts as specified for the ERTS satellites. The instrument is used for investigations of radiation fluxes in the atmosphere, radiation characteristics of clouds, and test for remote sensing techniques. Author

N72-28446# Ludwig-Maximilians-Universitat, Munich (West Germany). Meteorologisches Inst.
STUDIES FOR THE METEOROLOGICAL PART OF A GEOPHYSICAL SATELLITE PAYLOAD
Hans-Jurgen Bolle and Friedrich Koepp Apr. 1972 95 p refs In GERMAN; ENGLISH summary
(BMBW-FB-W-72-12) Avail: NTIS HC $6.75; ZLDI Munich: 19.75 DM

The revised mission study for a geophysical satellite is reported. Only the meteorological part of the payload is discussed which consists of radiometers for vertical sounding experiments and a scanning radiometer. The payload was planned as a contribution to the GARP satellite observation system. Author

N72-28447# Ludwig-Maximilians-Universitat, Munich (West Germany). Meteorologisches Inst.
ROCKET-BORNE RADIOMETERS FOR THE DETERMINATION OF DENSITY PROFILES OF MINOR ATMOSPHERIC CONSTITUENTS
Peter Burkert and Dieter Rabus Apr. 1972 48 p refs In GERMAN; ENGLISH summary
(BMBW-FB-W-72-11) Avail: NTIS HC $4.50; ZLDI Munich: 9.90 DM

For a flight experiment in a sun stabilized Aerobee rocket a set of 6 radiometers was constructed. Through these instruments the absorption of the solar radiation by the atmosphere in infrared bands of the minor constituents H2O, CO2, CH4, and O3 shall be determined. Construction of the single instrument, the integration with the payload, and alignment procedures are described. Author

N72-28448# Ludwig-Maximilians-Universitat, Munich (West Germany). Meteorologisches Inst.
TWO CHANNEL RADIOMETER FOR THE DETERMINATION OF O2-CONCENTRATION IN THE THERMOSPHERE
Lothar Bierling and Hans-Jurgen Bolle Apr. 1972 76 p refs In GERMAN; ENGLISH summary
(BMBW-FB-W-72-10) Avail: NTIS HC $6.00; ZLDI Munich: 15.75 DM

Details on the development of an experiment for the determination of thermospheric O2-concentration by optical occultation measurements from sun-stabilized space vehicles, are given. Author

N72-28449# National Academy of Sciences-National Research Council, Washington, D.C. Highway Research Board.
AERIAL SURVEYS AND PHOTOGRAMMETRY (4 REPORTS) Highway Research Record, No. 375
1971 44 p refs
Avail: NTIS HC $4.25

Aerial surveys and photogrammetric procedures of traffic engineering for highway design and construction are presented. For individual titles, see N72-28450 through N72-28453.

N72-28450 Wisconsin Dept. of Transportation, Madison. Div. of Highways.

EVALUATION OF PHOTOGRAMMETRIC CROSS SECTIONS FOR EARTHWORK PAYMENT

Vernon H. Schultz *In* NAS/NRC Aerial Surv. and Photogrammetry 1971 p 1-7 refs Presented at the 50th Ann. Meeting of the Comm. on Photogrammetry and Aerial Surv. Sponsored by Comm. on Photogrammetry and aerial surv. (For availability see N72-28449 19-14)

Earthwork quantities were compared on four projects by using both photogrammetric final cross sections and conventional field-measured final cross sections. Original cross sections had been taken by conventional field procedures. It was found that for dual roadway sections involving 7,500 cu yd or more per station the difference between photogrammetric and field-measured yardage was 2 percent or less. On those roadway sections involving 12,000 cu yd or more per station, the difference was less than 1 percent. In all cases the photogrammetric yardage was greater than the field-measured yardage. When interpolated photogrammetric elevations were compared to field elevations, it was observed that the average mean difference showed the photogrammetric to be 0.15 ft lower than the field. It was concluded that the difference in earthwork quantities was within the range of possible error because of the average end area method of computation, and therefore the photogrammetric method will produce an accurate estimate usable for payment. Author

N72-28451 Wisconsin Dept. of Transportation, Madison. Div. of Highways.

DEVELOPMENT AND PRODUCTION OF TWO-COLOR AERIAL PHOTOMOSAIC CONTRACT PLANS

Vernon H. Schultz and William E. Frantz *In* NAS/NRC Aerial Surv. and Photogrammetry 1971 p 8-14 Presented at the 50th Ann. Meeting of the Comm. on Photogrammetry and Aerial Surv. Sponsored by Comm. on Photogrammetry and Aerial Surv. (For availability see N72-28449 19-14)

The increased complexity of highway design and construction has prompted the use of aerial photography and two color printing to depict proposed designs more easily. A soft green ink is used to show the aerial photograph background and black ink shows the proposed designs. The technique is a departure from traditional drafting methods in that a base drawing is used for one color (green) and an overlay drawing for the other color (black). This method is compatible with the modern scissors drafting or stickup technique now being used by many state highway departments. Results have shown greater clarity and increased flexibility in the use of aerial photography and better results in reproductions from black and white microfilm. Author

N72-28452 Ohio Dept. of Highways, Columbus.

AN EXPERIMENTAL INVESTIGATION OF HIGHWAY SURVEYING AND MAPPING CONTROL EXTENSION BY TRILATERATION AND CONVENTIONAL TRAVERSE c13

Shuh-Chai Lee and Anatol Leo Belkin *In* NAS/NRC Aerial Surv. and Photogrammetry 1971 p 15-27 refs Sponsored by Comm. on Photogrammetry and Aerial Surv.; funded by the Federal Highway Admin. (For availability see N72-28449 19-14)

A chain of 16 quadrilaterals approximately 6 miles in length along I-71 was used to evaluate ground control extension by trilateration and conventional traverse. Distances were measured with a geodimeter, and angles were measured with a Wild T2 theodolite. A FORTRAN computer program was developed to adjust the trilateration network. The method is based on a previously developed and published method of trilateration adjustments. The traverse adjustment was accomplished by using the least squares method. Results of the experiments show that trilateration is more accurate than conventional traverse and is at least as economical. It is recommended that a trilateration chain of quadrilaterals be used where a double centerline or double traverse is needed for higway surveying or mapping control. The methodology and computer program have permitted this method to be used wherever economically advantageous. Author

N72-28453 Wisconsin Dept. of Transportation, Madison. Div. of Highways.

TRAFFIC DATA COLLECTION THROUGH AERIAL PHOTOGRAPHY

David J. Cyra *In* NAS/NRC Aerial Surv. and Photogrammetry 1971 p 28-39 refs Sponsored by Comm. on Photogrammetry and Aerial Surv. and Comm. on Traffic Flow Theory and Characteristics (For availability see N72-28449 19-14)

A comprehensive traffic study on freeways with the highest volume is reported. This input output study consisted of manually recording volumes and speeds during peak periods over a 5 1/2-mile freeway section. Vehicle accumulation and speed data were collected and processed. An aerial study using time lapse photography collected similar data during the same peak period. Oblique aerial photography was used to collect vehicle accumulation data, and vertical aerial photography was used to collect vehicle speed data. Statistical analyses were made to determine the reliability of the aerial photographic collection techniques as compared to the conventional collection procedures. In addition to method reliability, actual cost comparisons were made and indicated that oblique aerial photography is a reliable and economical method for collecting vehicle accumulations and that vertical photography is a reliable method for collecting vehicle speeds and headways. Author

N72-28454*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SENSITIVITY OF HOT-CATHODE IONIZATION VACUUM GAGES IN SEVERAL GASES

Raymond Holanda Washington Jul. 1972 21 p refs

(NASA-TN-D-6815; E-6759) Avail: NTIS HC $3.00 CSCL 14B

Four hot-cathode ionization vacuum gages were calibrated in 12 gases. The relative sensitivities of these gages were compared to several gas properties. Ionization cross section was the physical property which correlated best with gage sensitivity. The effects of gage accelerating voltage and ionization-cross-section energy level were analyzed. Recommendations for predicting gage sensitivity according to gage type were made. Author

N72-28455*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LIGHT-DETECTION ELECTRONICS FOR A RAMAN LIDAR

Robert J. Leser and Jack A. Salzman Washington Jul. 1972 28 p refs

(NASA-TN-D-6879; E-6864) Avail: NTIS HC $3.00 CSCL 20E

A light-detection system for an optical radar, or lidar, unit to be used for remote temperature and composition measurements was designed, built, and bench tested. This detection system processes three return signal wavelengths: two Raman wavelengths, and the Rayleigh-Mie wavelength at 694.3 nanometers. Means of coping with photomultiplier tube instabilities and limitations are discussed. Circuits for gain control, ranging, and digitizing are included. The phototube gains can be switched fully on in 80 meters (450 nsec) or off in 30 meters (200 nsec) of range. The range circuit processes signals from 0.1 to 2 kilometers, with an estimated range resolution of less than 5 meters. Author

N72-28456*# Barnes Engineering Co., Stamford, Conn.

DEVELOPMENT OF IMPROVED PYROELECTRIC DETECTORS: MEASUREMENTS OF PYROELECTRIC MATERIAL CHARACTERISTICS AND FET CHARACTERISTICS Quarterly Technical Report, 23 Feb. - 22 May 1972

Seymour Weiner and Henry Beerman 28 Jul. 1972 65 p refs (Contract NAS5-21655)

(NASA-CR-122446; BEC-2064QR3) Avail: NTIS HC $5.25 CSCL 14B

The object of this program is to improve the detectivity of the pyroelectric detector with the ultimate goal of operation at or near the temperature noise limit. Two general areas of investigation are undertaken. The first is to improve responsivity through the use of new materials. The second is directed toward reduction of

noise and will be effected with improved field effect transistor characteristics, and improved electroding of the pyroelectric material. The review of the literature on pyroelectric materials continues. From this, several materials have already been selected for investigation, and several were tested. Author

N72-28457*# California Univ., Riverside. Dept. of Geography.
PHOTOGRAPHIC FILMS AS REMOTE SENSORS FOR MEASURING ALBEDOS OF TERRESTRIAL SURFACES Final Report
Steven R. Pease (Wis. Univ., Milwaukee) and Robert W. Pease Mar. 1972 22 p refs
(NASA Order W-13265; USGS-14-08-001-11914)
(NASA-CR-127477; USGS-IR-NASA-225; TR-5) Avail: NTIS HC $3.25 CSCL 14E

To test the feasibility of remotely measuring the albedos of terrestrial surfaces from photographic images, an inquiry was carried out at ground level using several representative common surface targets. Problems of making such measurements with a spectrally selective sensor, such as photographic film, have been compared to previous work utilizing silicon cells. Two photographic approaches have been developed: a multispectral method which utilizes two or three photographic images made through conventional multispectral filters and a single shot method which utilizes the broad spectral sensitivity of black and white infrared film. Sensitometry related to the methods substitutes a Log Albedo scale for the conventional Log Exposure for creating characteristic curves. Certain constraints caused by illumination goemetry are discussed. Author

N72-28458*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FEASIBILITY STUDY: REPLACEMENT OF THE INOPERATIVE DECOMMUTATING BUFFER SUBSYSTEM FOR THE INSTRUMENTATION CHECKOUT COMPLEX IN THE QUALITY AND RELIABILITY ASSURANCE LABORATORY
James W. Hilliard 26 May 1972 27 p refs
(NASA-TM-X-64676) Avail: NTIS HC $3.50 CSCL 14B

A general purpose computer system, that is necessary for replacement of the present inoperative signal decommutator special purpose computer subsystem is described. The present decommutator subsystem has a very poor history of reliability and since April 1970, it has become inoperative because the core memory cannot be repaired. Functions of the present signal, decommutator subsystem are to receive, demultiplex, record in real time, playback in real time, and output to the SDS-930 control computer for analysis of the telemetry data. Recommendations for replacement of the inoperative telemetry decommutator subsystem are for the purchase of a mini-computer. Author

N72-28459*# Harvard Coll. Observatory, Cambridge, Mass.
TO INSTRUMENT A SOLAR POINTED SPECTROMETER SPECTROHELIOMETER FOR OSO-G Final Report
Leo Goldberg May 1972 98 p refs
(Contract NAS5-9274)
(NASA-CR-122505) Avail: NTIS HC $7.00 CSCL 14B

The preparation of a solar pointed spectrometer-spectroheliometer instrument for the orbiting solar observatory G is reported. This completes the documentation requirements with summaries of the hardware and post launch data analysis effects. Author

N72-28460*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
[AN APPARATUS USED IN THE CALIBRATION OF ULTRA HIGH VACUUM SYSTEM] Patent Application
Ronald A. Outlaw, Richard E. Stell, and Ronald F. Hoyt, inventors (to NASA) Filed 14 Jul. 1972 16 p
(NASA-Case-LAR-10862-1; US-Patent-Appl-SN-271951) Avail: NTIS HC $3.00 CSCL 14B

A compact calibration assembly is described for ultra high vacuum gages which depends on the repeatable generation of a specific gas pressure by the dissociation of a solid solution chemical compound when subjected to a given temperature. A precise temperature measurement is related to the pressure generated within the vacuum by the properties of the solid solution compound. This accurately establishes the gas pressure which in turn is used to calibrate a vacuum gage. A metering orifice is also included for the calibration system and is made movable to facilitate the degassing bakeout required in ultrahigh vacuum devices. NASA

N72-28461*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
APPARATUS FOR SCANNING THE SURFACE OF A CYLINDRICAL BODY Patent Application
Robert B. Nakich and Raymond C. Woodbury, inventors (to NASA) Filed 28 Jun. 1972 19 p
(Contract NAS7-100)
(NASA-Case-NPO-11861-1; US-Patent-Appl-SN-266911) Avail: NTIS HC $3.00 CSCL 14B

An apparatus for providing a two dimensional display of a cylindrical surface is described. The device has application for displaying the markings on a fired bullet. The device used laser beams and vibrating mirrors to deflect the laser beams. A cathode ray tube is used to display the two dimensional effect obtained from the laser illumination. The application for surface analysis of precision shafts used in rotating machinery is also recommended. NASA

N72-28462*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SYSTEM XOR CALIBRATING PRESSURE TRANSDUCER Patent Application
Garland N. Rollins, inventor (to NASA) Filed 30 Mar. 1972 18 p
(NASA-Case-LAR-10910-1; US-Patent-Appl-SN-239577) Avail: NTIS HC $3.00 CSCL 14B

A system for calibrating a pressure transducer which has a reference portion and an active portion is described. A miniature selector valve is positioned immediately adjacent the pressure tranducer. A reference pressure, known pressure, and unknown pressure can be selectively admitted to the active side of the pressure transducer by the selector valve to enable calibration of the transducer. A valve admits pressure to the selector valve which has a piston and floating piston arrangement which allows proper selection with very small linear movement. NASA

N72-28463*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HIGH FIELD CdS DETECTOR FOR INFRARED RADIATION Patent Application
Ramesh C. Tyagi (NAS-NRC), James B. Robertson, Karl W. Boeer (Univ. of Delaware), and Henry C. Hadley, Jr., inventors (to NASA) (Univ. of Delaware) Filed 26 Jul. 1972 9 p
(NASA-Case-LAR-11027-1; US-Patent-Appl-SN-275118) Avail: NTIS HC $3.00 CSCL 14B

An infrared detector composed of a cadmium sulfide (CdS) platelet is described. The platelet has a cathode formed on one end and an anode formed on the other end. The platelet is suitably doped such that stationary high field domains are formed adjacent the cathode when biased in the negative differential conductivity region. A negative potential is applied to the cathode such that a high field domain is formed adjacent to the cathode. A potential measuring probe is located between the cathode and the anode at the edge of the high field domain and means are provided for measuring the potential at the probe whereby this measurement is indicative of the infrared radiation striking the platelet. NASA

N72-28464# Defence Research Establishment Valcartier (Quebec).
RESOLUTION OF THE MICROWAVE LENS SYSTEM USED IN AN XS-BAND INTERFEROMETER

A. Fitchett May 1972 34 p refs
(DREV-TN-1998/72) Avail: NTIS HC $3.75

A dual channel focused beam Xs-band microwave interferometer was installed on a hypersonic range 5 facility to provide estimates of mean electron density levels simultaneously with electrostatic probe and microwave scattering measurements in the turbulent wakes of hypersonic spheres. As part of the assessment of this equipment, a survey was undertaken of the field intensity in the image of the system. The field pattern measurements were made on a single double plano-convex lens, mounted in a standard optical bench which was fitted with a traversing bar mechanism carrying the field probe apparatus. Intensity field patterns, derived by transverse scans at various axial distances from the lens, were subsequently used to derive contour plots of field intensity in the plane containing the axis of the lens. Author

N72-28465# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
THE THREE DIMENSIONAL QUADRUPOLE MASS SPECTROMETER
S. Mastoris Jan. 1972 34 p refs
(UTIAS-TN-172) Avail: NTIS HC $3.75

A new type of mass analyzer was studied with a view to increasing the discrimination and sensitivity capabilities. The three dimensional quadrupole mass spectrometer may be used as a universal trace gas analyzer or in the ion gauge mode as an ultra-high vacuum guage. The instrument is capable of storing a specific mass-to-charge ratio or a range of such ratios for a sufficient time accumulating the species until they become detectable. The instrument was built and tested for practicality of operation, reliability and sensitivity. Results indicated that there are several areas of uncertainty in the operation of the instrument. The most significant of these were the ionization and detection processes. Otherwise, the instrument demonstrated its most useful capability of trapping and accumulating a species. This is seen as a significant step in the process of attaining higher degrees of sensitivity in trace gas analyzers. Author

N72-28466*# Perkin-Elmer Corp., Norwalk, Conn. Optical Group.
EVALUATION OF THE THIN DEFORMABLE ACTIVE OPTICS MIRROR CONCEPT
Hugh J. Robertson Washington NASA Jun. 1972 144 p refs
(Contract NAS1-9759)
(NASA-CR-2073; ER-10859) Avail: NTIS HC $3.00 CSCL 20F

The active optics concept using a thin deformable mirror has been successfully demonstrated using a 30 in. diameter, 1/2 in. thick mirror and a 61 point matrix of forces for alignment. Many of the problems associated with the design, fabrication, and launch of large aperture diffraction-limited astronomical telescopes have been resolved and experimental data created that can provide accurate predictions of performance in orbit. Author

N72-28467*# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Labs.
MICROPHONE DENSITY GAGE EXPERIMENT FOR OGO-F Final Report
Jul. 1972 87 p refs
(Contract NAS5-9334)
(NASA-CR-122510; LMSC/L-73-72-1) Avail: NTIS HC $6.50 CSCL 14B

A description is given of the fabrication, installation, and operation of the microphone density gage instrument. An analysis of the resulting problems and minor failures is also given. The approach to the data analysis is discussed and the significant results obtained are presented. Author

N72-28468*# Barnes Engineering Co., Stamford, Conn.
SYSTEM DESIGN AND PERFORMANCE OF EARTH/LUNAR HORIZON SENSOR BEC PROJECT 3744 Final Report
F. Schwarz, T. Falk, G. Falbel, and P. Spangenberg 21 Oct. 1966 62 p ref
(Contract NAS9-4962)
(NASA-CR-115750; TR-3744-11A) Avail: NTIS HC $5.25 CSCL 20F

An infrared horizon sensor system has been designed which is capable of searching over a wide field for the edges of a planet and, upon locating such edges, stations itself in a position which provides signals which identify the local vertical to the planet. In this fixed attitude it requires no continuous mechanical movement and operates with a minimum utilization of power. The system is thus capable of providing a high degree of accuracy when used for local vertical determination in orbits around the earth, the moon, or other planets. A detailed description of the design and operating features of the horizon scanner is given and the evaluation test data which have been completed are presented. Author

N72-28469*# Arizona Univ., Tucson. Optical Sciences Center.
APOLLO 9 MULTIBAND PHOTOGRAPHY EXPERIMENT S065
R. A. Schowengerdt and P. N. Slater May 1972 46 p refs
(Contract NAS9-9333)
(NASA-CR-115737; TM-3) Avail: NTIS HC $4.50 CSCL 14E

Fourier analysis was applied to microdensitometer scans of a selected region of one SO65 frame in each of the three black-and-white bands. The approach was unique because a somewhat arbitrary section of the image was used and not limited to available targets as in edge analysis. Comparison of duplicates and calculation of absolute SO65 MTF were done by applying linear systems theory to the spatial spectra of the image scans. It was found that the duplication process was nonlinear and resulted in general amplification of spatial frequency modulation. However, the increase in modulation was offset by a corresponding increase in the granularity of the copies. The amount of increase seemed to be related to the initial granularity, but a direct relationship was not verified. Band-to-band comparison of image quality was achieved in the form of signal-to-noise ratio curves as a function of spatial frequency for each band. From this standpoint the DD band was an order of magnitude better than the other two. These were several factors that restricted the analysis of the Apollo 9 imagery. Among these were the lack of precise sensitometric and optical system data on the high altitude photography. In addition it was determined that there was only one simultaneous pair of high altitude and SO65 frames. Finally, the original SO65 photography was not available for scanning (for obvious reasons), thus eliminating a reference base for granularity and SO65 MTF determination. Author

N72-28470# Joint Publications Research Service, Arlington, Va.
ADJUSTABLE SINGLE-STAGE IMPACTER
Ye. P. Vishnevskiy 28 Jul. 1972 10 p refs Transl. into ENGLISH from Gigiena i Sanit. (Moscow), no. 5, May 1972 p 72-77
(JPRS-56630) Avail: NTIS HC $3.00

A device for studying distribution of weight, number of particles, and activity of various chemical elements in aerosol systems with fineness of disperse phase ranging from 1 to 40 microns is described. It can be utilized in the calibration of photoelectrical and other aerosol counters, as well as in systems of selective sampling with differentiation of inhaled aerosol fractions. Author

N72-28471# Communications Research Centre, Ottawa (Ontario).
MICROWAVE RADIOMETRY FOR SURVEILLANCE FROM SPACECRAFT AND AIRCRAFT
A. W. Adey Jan. 1972 30 p refs
Avail: NTIS HC $3.50

The status of current airborne and satellite remote-sensing programs based on microwave radiometers is reviewed. Details of instrumentation capabilities and limitations are provided.

Research areas and problems where these devices appear to have application are discussed. Author

N72-28472# Royal Aircraft Establishment, Farnborough (England).
PROPERTIES OF THE PHOTOGRAPHIC EMULSION DURING DISCONTINUOUS EXPOSURE
A. L. Kartuzhanskii and P. V. Meiklyar Jun. 1972 19 p refs Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (USSR), v. 21, no. 5, 1951 p 598-609
(RAE-Lib-Trans-1598; BR-29559) Avail: NTIS HC $3.00

A study was made of the dependence of the sensitivity and coefficient of contrast of a photographic emulsion during discontinuous exposure, on the total number of light impulses, the duration of the individual light impulse, the duration of the dark pause, and the frequency of the impulses. Data were obtained for a number of photographic materials, for various blackening densities, and in different development conditions. Author

N72-28473# Swiss Inst. of Meteorology, Zurich.
THE VARIOUS MEASURING METHODS FOR DETERMINING RADIATION INTENSITY WITH THE COMPENSATION PYRHELIOMETER AND THE DEVELOPMENT OF AN IMPROVED MODEL [DIE VERSCHIEDENEN MESSVERFAHREN ZUR BESTIMMUNG DER STRAHLUNGSINTENSITAET MIT DEM KOMPENSATIONSPYRHELIOMETER UND DIE ENTWICKLUNG EINES VERBESSERTEN MODELLS]
C. Froehlich (Physik.-Meteorologisches Obs.) and H. Wierzejewski (Physik.-Meteorologisches Obs.) 1972 33 p refs In GERMAN; ENGLISH summary
(Publ-25) Avail: NTIS HC $3.75

Different procedures available for measuring sun radiation with the Angstrom compensating pyroheliometer are described and discussed. The measuring procedure consists normally of the following parts: (1) determination of the reference point, (2) a first measurement of the compensating current flowing through the shaded strip with the other strip irradiated, and (3) a second measurement with the roles of the strips interchanged. From the two measured currents a mean intensity can be calculated, that is some mean of the incoming intensities at the time of both measurements. During the comparison of different pyroheliometers different mean intensity values can be obtained depending upon the measuring and evaluation technique even if the acceptance angles are equal for the different instruments. These systematic deviations are due to the asymmetries of the individual instruments. It can be shown that only one measuring and evaluation method yields the same mean intensity, not depending upon the asymmetry. Further an improved design of a compensation pyroheliometer is described. The asymmetry of the two receiver strips is very low and fully automatic measurements are provided. Author

N72-28474*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN INVESTIGATION OF PHOTOSENSOR APERTURE SHAPING IN FACSIMILE CAMERAS
Stephen J. Katzberg, Friedrich O. Huck, and Stephen D. Wall Washington Aug. 1972 17 p refs
(NASA-TN-D-6882; L-8424) Avail: NTIS HC $3.00 CSCL 14E

Optical-mechanical scanning techniques are generally employed in instruments specifically designed to spectrally or radiometrically characterize variations in scene brightness. The effect of aliasing, which can be caused by line scan sampling, on the spatial detail of the reconstructed image has, therefore, been of little concern. Emphasis of some recent applications of optical-mechanical scanning techniques in facsimile cameras is, however, on the spatial characterization of the scene which, as is shown, can be severely degraded by aliasing. The characteristics of aliasing are analyzed to establish quantitative bounds, and photosensor aperture shaping and line scan spacing are investigated as a means for reducing this degradation. Author

N72-28475# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
A PARALLEL MOTION CREEP EXTENSOMETER Aeronautical Research Council Current Papers
J. N. Webb 1971 38 p refs Supersedes RAE-TR-70068; ARC-32319
(ARC-CP-1173; RAE-TR-70068; ARC-32319) Avail: NTIS HC $4.00; HMSO 55p; PHI $2.45

The optical lever creep extensometer was developed as part of a large program aimed at improving measurement and defining test conditions more precisely. The leaf spring parallel motion and the magnetic loading of the measuring roller are considered to offer significant advantages over conventional types. Their use in a creep research program is reviewed, and suggestions for further improvements are made. Author

N72-28476# Oak Ridge National Lab., Tenn.
QUALITY ASSURANCE PLAN FOR THE LARGE-SCALE PROCUREMENT OF TEMPERATURE SENSORS
M. B. Herskovitz 1 Mar. 1972 18 p refs Supersedes GF-71-12-37 Sponsored by AEC
(ORNL-TM-3740; GF-71-12-37) Avail: NTIS

A quality assurance program plan was prepared for large scale procurement of thermocouple bulk material and assemblies. This plan describes the functions and responsibilities of each participant, i.e., the seller, the user, and ORNL personnel in specifying, procuring, storing, assembling, testing, and shipping bulk materials, assemblies, and samples. This plan assures users that they will obtain thermocouples that meet the requirements specified by them. Author (NSA)

N72-28477# Istituto di Fisica Dell Atmosfera, Rome (Italy).
RADIOGONIOMETER FOR ATMOSPHERIC (LIGHTING DIRECTION FINDER) [RADIOGONIOMETRO PER ATMOSFERICI]
M. Severini and U. Guiducci Mar. 1971 59 p refs In ITALIAN; ENGLISH summary
(IFA-TR-36) Avail: NTIS HC $5.00

The working principles and the main characteristics of a new solid state and fully automatic radiogoniometer for atmospherics are presented. The experimental results obtained show that angular resolution characteristics, signal to noise ratio and range, are comparable with those of similar equipment presently in use. In addition considerable versatility is also achieved due to the output system and low operational and production costs. Author (ESRO)

N72-28478# Ernst-Mach-Inst., Freiburg (West Germany).
A SIMPLE LIGHT-SCREEN TRIGGER SYSTEM USING A HELIUM NEON LASER [AUFBAU EINES EINFACHEN LICHTSCHRANKENSYSTEMS MIT EINEM HE-NE-LASER]
A. Stilp and H. Giesbrecht Jun. 1971 14 p ref In GERMAN; ENGLISH summary
(Rept-4/71) Avail: NTIS HC $3.00

The structure of a simple light-screen trigger system for use in the aeroballistic range of the EMI is described. This system also operates reliably for velocities above 2 km/sec and for arbitrary projectile calibers and forms. It consists of a He-Ne-laser, a photodiode and two plane mirrors. No further optics are necessary. The installment of such a system in a velocity measuring device for use in ordnance problems is briefly outlined. Author (ESRO)

N72-28479# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France).
EVALUATION OF THE KEARFOTT GYROSCOPE, TYPE GYROFLEX, MOD. 2: RESULTS OBTAINED WITH THE GYROSCOPE NO. 3441 [EVALUATION DU GYROSCOPE KEARFOTT TYPE GYROFLEX MOD 2 RESULTATS OBTENUS SUR L'APPAREIL NO. 3441]
26 Apr. 1971 122 p In FRENCH
(Contract DTEN-71/179)

(LRBA-E-209-NT-1/SIE) Avail: NTIS HC $8.25

Tests performed from May 1971 to February 1972 on the Kearfott gyroflex gyroscope model 2, serial number 3441, are reported. Although this gyroscope was designed for use onboard aircraft, a full evaluation of its performance was carried out to ascertain its possible use for other purposes such as marine or missiles. A technological description of the universal joint is presented. On the whole the gyroscope performs better than required by the contract. ESRO

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication; friction, and wear; manufacturing processes and quality control, and reliability; drafting; and materials fabrication, handling, and inspection.

N72-28480# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

PHOTOGRAPHIC EQUIPMENT Final Report

25 Feb. 1972 8 p

(AD-739598; TOP-10-3-130) Avail: NTIS CSCL 14/5

Describes a method for evaluation of photographic equipment operational and functional performance characteristics. Identifies supporting test, facilities, and equipment required. Provides procedures for functional performance tests. Applicable to cameras (still and motion), printers (contact and enlarger), and processing equipment such as processing machines, tanks, and driers. Not applicable to service testing of projectors and related equipment. Author (GRA)

N72-28481# Army Materials and Mechanics Research Center, Watertown, Mass.

FATIGUE CRACK INITIATION STUDIES USING FLASH PHOTOMICROGRAPHY. PART 1: EXPERIMENTAL EQUIPMENT AND PROCUDURE

Ralph Papirno and Burton S. Parker Dec. 1971 23 p refs

(DA Proj. 1T0-61102-B-32-A)

(AD-739899; AMMRC-TR-71-51) Avail: NTIS CSCL 14/2

An automatic system was developed to take flash photomicrographs of the roots of notches in flat, doubly-notched specimens during low-cycle fatigue tests to determine the cyclic time of crack initiation. The photomicrographs are taken periodically during the test usually at 50- or 100-cycle intervals until a well-defined crack has formed at the notch root and extends across the full thickness of the specimen. For analyzing the film record, each frame of the developed negative is projected on a screen starting at the last frame on the film, and the well-defined crack is traced backward in time, frame by frame to its initiation. A crack is judged to have initiated where it is visible in one frame and not evident on the frame just preceding. Cracks with a surface length on the specimen of approximately 0.001 inch and an opening of 0.0001 inch are easily visible in the projected images. In the report, the system is described in detail. Author (GRA)

N72-28482# British Steel Corp., London (England). General Steels Div.

COMMISSIONING THE UVAQ DIRECT READING OPTICAL SPECTROMETER

J. Reid Feb. 1972 13 p

(PB-208277; GS/TECH/127/1/71/C) Avail: NTIS HC $3.00 CSCL 14B

The UVAQ direct reading optical spectrometer was set up and calibration graphs prepared for the determination of C, Si, Mn, P, S, Cr, Mo, Ni, Al, B, Cu, Nb, Sn, Ti, V, Zr in mild and low alloy steels. The repeatability of replicate readings was determined and found to be comparable with the manufacturers specifications. The accuracy is also considered to be satisfactory for most elements. No systematic interferences were noted. Author (GRA)

N72-28483 National Lending Library for Science and Technology, Boston Spa (England).

NEW BEARING MATERIALS FOR ULTRA-HIGH VACUUM

H. E. Hintermann and H. Gass 15 Oct. 1971 11 p Transl. into ENGLISH from Schweiz Arch. (Solothurn), v. 36, Jun. 1970 p 189-193

(NLL-Risley-Tr-2238-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The friction and wear characteristics of possible bearing materials under different environmental conditions were determined. Materials include chromium steels type DIN 100 Cr 6 and DIN C110 WI, TiC, silver alloys with gallium and indium, a pure polymide substance or a MoS2 impregnated polymide, and sintered Al2O3. Test results show TiC against Al2O3 gives the best wear and friction results. Author

N72-28484 National Lending Library for Science and Technology, Boston Spa (England).

DEVELOPMENT OF A BEARING FOR THE DE-SPUN ANTENNA OF A SPIN-STABILISER SATELLITE. PART 1: FUNDAMENTAL INVESTIGATIONS

26 Feb. 1972 31 p Transl. into ENGLISH from foreign language report

(NLL-Risley-Tr-2340-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

The development of a bearing and bearing materials to be used with the antenna of a spin-stabilized satellite is discussed. The influence of hardness on the coefficient of sliding friction of metals under pressure is examined as a preliminary to selecting bearing materials. The test equipment and test specimen configurations are described. The results of tests conducted on maraging steels, beryllium-copper, and Teflon materials are presented. It was concluded that sliding bearings with solid lubricants provided the longest service life under space conditions. P.N.F.

N72-28485 National Lending Library for Science and Technology, Boston Spa (England).

THE PLASTIC UPSETTING OF MULTILAYER PACKS

E. S. Makarov [1971] 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), v. 14, no. 11, 1971 p 102-104

(NLL-M-21319-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Upper boundary solutions, based on experimental principles of the theory of plastic flow, were applied to the problem of the upsetting of multilayer packs. The theoretical results are compared with the experimental results and found to give good agreement. Author

N72-28486 National Lending Library for Science and Technology, Boston Spa (England).

RELATIONSHIPS BETWEEN FRICTION AND WEAR PROPERTIES AND THE FINE STRUCTURE OF POLYTETRAFLUOROETHYLENE. ALTERATIONS IN THE SLIPPING SURFACES

H. Jost and J. Richter-Mendau [1971] 38 p refs Transl. into ENGLISH from Plaste Kautschuk (Leipzig), v. 18, no. 6, 1971 p 436-443 In ENGLISH and GERMAN

(NLL-M-22376-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 4 NLL photocopy coupons

Sliding properties of polytetrafluroethylene (PTFE) are discussed on the basis of its low adhesion and small friction against solids. A study was made of the relationships between friction and wear properties of PTFE and the alternations in fine structure on heavy mechanical stresses. For simplification, blocks of PTFE without fillers were used. Author

N72-28487 National Lending Library for Science and Technology, Boston Spa (England).
APPARATUS FOR STUDYING ROLLING FRICTION IN AN ULTRA-HIGH VACUUM
U. Zimmerli 20 Feb. 1972 19 p refs Transl. into ENGLISH from Wear (Amsterdam), v. 18, 1971 p 173-186
(NLL-RISLEY-TR-2350-(9091.9F)) Avail: Natl. Lending Library, Boston, Spa, Engl: 2 NLL photocopy coupons

An apparatus is described which was designed and constructed to study the properties of pairs of materials and select them for ball bearings operating in ultra high vacuum at low speed without lubrication. Measurements of motion damped by friction in a pendulum system were examined by a computer program and preliminary results are reported. Author

N72-28488 National Lending Library for Science and Technology, Boston Spa (England).
ELECTODEPOSITED ALLOYS: PREPARATION AND PROPERTIES, PART 1
Vu Quang Kinh 29 Feb. 1972 29 p refs Transl. into ENGLISH from Corros.-Trait., Prot., Finition (France), no. 19, 1971 p 93-105 In ENGLISH and FRENCH
(NLL-Trans-746-1074-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

Possibilities offered by the electrodeposition of alloys are considered. The problems posed by the preparation of electrolytic alloys are discussed. The basic principles of the codeposition of metals are presented, including static and dynamic potentials of ion reduction and simultaneous reduction laws for metals. The effects of experimental parameters on the composition of electrodeposited alloys are reviewed. K.P.D.

N72-28489 National Lending Library for Science and Technology, Boston Spa (England).
USE OF ULTRASONICS IN PRODUCTION TECHNOLOGY OF NON-FERRONS METALS
N. N. Khavskii, T. R. Smirnov, and A. A. Bershitskii 29 Feb. 1972 20 p refs Transl. into ENGLISH from Tsvetn. Metal. (Moscow), no. 4, 1971 p 4-11 In ENGLISH and RUSSIAN
(NLL-Trans-746-1130-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Sources of acoustic energy and types of emitters are considered. The use of ultrasonics in ore enrichment is discussed. Ultrasonic applications to hydrometallurgical investigations are also reviewed. K.P.D.

N72-28490 National Lending Library for Science and Technology, Boston Spa (England).
SOME LAWS FOR CEMENTATION OF COPPER BY IRON IN ULTRASONIC FIELDS
M. I. Alkatsev 29 Feb. 1972 16 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Tsvet. Met. (Dzaudzhikau), v. 14, no. 4, 1971 p 7-14 In ENGLISH and RUSSIAN
(NLL-Trans-746-1158-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The kinetic laws of cementation of single metals by other metals from their solutions in an ultrasonic field are analyzed. The cementation of Cu by Fe with a vibration frequency of 830 kHz and an intensity up to 2.0 watts/sq cm was used for the study. Experimental results established: (1) The cementation rate is increased by acid concentrations from 0 to 2.5 g/l. (2) The rate of cementation depends on the position of the Fe electrode in the ultrasonic field. (3) A concentration of more than 5.0 g/l Cu decreases the cementation process. (4) The density of cementated Cu on the surface of Fe is the main factor limiting the cementation process. E.H.W.

N72-28491 National Lending Library for Science and Technology, Boston Spa (England).
EXPERIMENTAL INDUSTRIAL INVESTIGATIONS ON THE MANUFACTURE OF PIGMENTARY TITANIUM DIOXIDE BY BURNING TITANIUM TETRACHLORIDE IN THE JET OF A HYDROGEN FLAME
N. V. Galitskii, A. V. Kondratenko, G. N. Lebedev, V. I. Vatamanyuk, L. V. Pisarev, and T. S. Pechenik May 1972 14 p ref Transl. into ENGLISH from Sb. Tr. Vses. Nauch.-Issled Proekt. Inst. Titana (USSR), v. 6, 1970 p 47-54
(NLL-RTS-7157) Avail: NTIS Avail: Natl. Lending Library, Boston Spa, Engl.: £1.30; 4 NLL photocopy coupons

The experimental industrial manufacture of TiO2 by high temperature hydrolysis is discussed. The tests revealed the possibility of obtaining pigmentary TiO2 by burning TiCl4 in the jet of an air-hydrogen flame using Al and Ti as constructural materials. The bulk of TiO2 was recovered in the process. The high chlorine content, low pH of aqueous extract, and the presence of rutile rendered the pigmentary TiO2 unsuitable for industrial use. E.H.W.

N72-28492 National Lending Library for Science and Technology, Boston Spa (England).
HYDROSTATIC PRESSURE REVERSE PRESSING OF THIN WALLED COVER TYPE PRODUCTS
A. A. Bannov May 1972 9 p Transl. into ENGLISH from Kuznechno-Shtampovochnoe Proizvod. (USSR), no. 5, 1970 p 16-18
(NLL-RTS-7141) Avail: Natl. Lending Library, Boston Spa, Engl.: £0.80; 3 NLL photocopy coupons

The hydrostatic reverse pressing of a thin walled spherical metal component is described. In the first pass the deep conferential groove around the perimeter of the component being pressed is shaped, and in the second pass the semiproduct so produced is reversed and the spherical shape formed. The operation is carried out in a die with detachable insert. Author

N72-28493 National Lending Library for Science and Technology, Boston Spa (England).
THE SELECTION OF SOLID LUBRICANTS. 1: HEAT STABILITY OF SOME SOLID LUBRICANTS
V. N. Miroshnikov 7 May 1972 9 p refs Transl. into ENGLISH from Poroshkovaya Met., Akad. Nauk Ukr. SSR (Kiev), V. 11, no. 11, 1971 p 72-77
(NLL-Risley-Tr-2361-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The thermal stability of aluminium, barium, calcium, and magnesium fluorides in hydrogen, air, and steam over the temperature range 100 to 1100 C was studied. Their thermal stability was estimated relative to that of zinc sulphide. An a priori analysis of the behavior of the materials in the gases cited, made by using well known thermodynamic relationships (the Gibbs-Helmholz equation and the reaction isotherm), showed that the fluorides studied have an appreciably higher bond energy than zinc sulphide, particularly in their reaction with oxygen. The fluorides also have a thermal stability 1 to 2 orders of magnitude higher than that of zinc sulfide over the temperature range 500 to 1100 C in air and in hydrogen. Author

N72-28494 National Lending Library for Science and Technology, Boston Spa (England).
UNISURF METHOD FOR THE NUMERICAL DEFINITION OF NON-MATHEMATICAL SURFACES
P. Bezier 17 Apr. 1972 11 p Transl. into ENGLISH from Mecan.-Elec. (Paris), no. 219, Mar. 1968 p 17-20
(NLL-Trans-849-(9022.64)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

A method is presented for representing surfaces used in automobile coachwork machining. It may also be applied to surfaces containing a fairly large number of points defined with varying degrees of accuracy. The conditions to be met, basic principles involved (including accuracy and design of curves and surfaces), and the elements of the system are described. The

system is characterized by the use of an ordinary computer which plays, either independently or simultaneously, the role of function generator, interpolator, and operating control. Author

N72-28495* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REMOTE CONTROL MANIPULATOR FOR ZERO GRAVITY ENVIRONMENT Patent
Frederic E. Wells, inventor (to NASA) Issued 4 Jan. 1972 5 p Filed 18 Sep. 1970 Supersedes N72-15474 (10 - 06, p 0778)
(NASA-Case-MFS-14405; US-Patent-3,631,737; US-Patent-Appl-SN-73283; US-Patent-Class-74-469; US-Patent-Class-214-1CM) Avail: US Patent Office CSCL 13I

A manipulator is described for handling objects remotely in a zero gravity environment. It is composed of rigid tubular sections joined end-to-end by flexible joints to form an articulated arm based at one end and free at the other end. Each of the rigid sections is manipulated by slender control cables attached to the respective sections and selectively extended and retracted. The cables are guided along the length of the articulated arm by means of the tubular sections, apertured disks at the flexible joints, and apertured lateral projections at the ends of the tubular sections. The free end of the articulated arm is provided with a grapple or an electromagnet for holding an object being handled.
Official Gazette of the U.S. Patent Office

N72-28496* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THERMAL COMPENSATING STRUCTURAL MEMBER Patent
Robert R. Belew, inventor (to NASA) Issued 11 Jul. 1972 6 p Filed 12 Feb. 1971 Supersedes N71-34423 (09 - 21, p 3432)
(NASA-Case-MFS-20433; US-Patent-3,675,376; US-Patent-Appl-SN-114847; US-Patent-Class-52-1; US-Patent-Class-52-573) Avail: US Patent Office CSCL 13I

A structural member that remains near a constant length when subjected to varying thermal loads is described. The structure includes an outer bi-metallic housing composed of inner and outer concentrically spaced casings attached to one another at one of their ends and left free to expand and contract at the other of their ends. The casings are made of materials having different coefficients of expansion and their lengths will vary with respect to one another as their thermal environment changes. A compensator strut is slidably mounted in the outer housing. A compensating drive linkage mounted on the free ends of the inner and outer casings so as to be rotated by relative movement between the casings is connected to the strut and causes sliding movement to maintain the structure at a constant length when the components change lengths due to expansion and contraction. Official Gazette of the U.S. Patent Office

N72-28497*# General Electric Co., Syracuse, N.Y. Electronics Lab.
DEVELOPMENT OF CHIP PASSIVATED MONOLITHIC COMPLEMENTARY MISFET CIRCUITS WITH BEAM LEADS Final Report, 12 Nov. 1970 - 15 May 1972
L. J. Ragonese, M. J. Kim, B. L. Corrie, J. W. Brouillette, and R. E. Warr 15 May 1972 18 p
(Contract NAS8-26498)
(NASA-CR-123742) Avail: NTIS HC $3.00 CSCL 14D

The results are presented of a program to demonstrate the processes for fabricating complementary MISFET beam-leaded circuits, which, potentially, are comparable in quality to available bipolar beam-lead chips that use silicon nitride passivation in conjunction with a platinum-titanium-gold metal system. Materials and techniques, different from the bipolar case, were used in order to be more compatible with the special requirements of fully passivated complementary MISFET devices. Two types of circuits were designed and fabricated, a D-flip-flop and a three-input NOR/NAND gate. Fifty beam-leaded chips of each type were constructed. A quality and reliability assurance program was performed to identify failure mechanisms. Sample tests and inspections (including destructive) were developed to measure the physical characteristics of the circuits. Author

N72-28498# Joint Publications Research Service, Arlington, Va.
EFFECT OF VARIABLE AXIAL RIGIDITY OF BALL BEARINGS ON VARIATION OF AXIAL LOAD ON GYROMOTOR BEARINGS
I. A. Baranov and G. Ye. Kaptur 12 Jun. 1972 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (USSR), v. 15, no. 3, 1972 p 79-83
(JPRS-56237) Avail: NTIS HC $3.00

An experimental and theoretical demonstration is given to show that the variable axial rigidity of ball bearings caused by defect in the rings and balls causes the axial load on the gyromotor bearings to change. Author

N72-28499*# Virginia Univ., Charlottesville.
EFFECT OF SUPPORT FLEXIBILTY AND DAMPING ON THE DYNAMIC RESPONSE OF A SINGLE MASS FLEXIBLE ROTOR IN ELASTIC BEARINGS
R. G. Kirk and E. J. Gunter Washington NASA Jul. 1972 60 p refs
(Grant NGR-47-005-050)
(NASA-CR-2083; ME-4040-105-71U) Avail: NTIS HC $3.00 CSCL 13I

A steady state analysis of the shaft and the bearing housing motion was made by assuming synchronous precession of the system. The conditions under which the support system would act as a dynamic vibration absorber at the rotor critical speed were studied; plots of the rotor and support amplitudes, phase angles, and forces transmitted were evaluated by the computer, and the performance curves were automatically plotted by a CalComp plotter unit. Curves are presented on the optimization of the support housing characteristics to attenuate the rotor unbalance response over the entire rotor speed range. The complete transient motion including rotor unbalance was examined by integrating the equations of motion numerically using a modified fourth order Runge-Kutta procedure, and the resulting whirl orbits were plotted by the CalComp plotter unit. The results of the transient analysis are discussed with regards to the design optimization procedure derived from the steady-state analysis.
Author

N72-28500# National Bureau of Standards, Washington, D.C. Office of Weights and Measures.
SPECIFICATIONS AND TOLERANCES FOR REFERENCE STANDARDS AND FIELD STANDARD WEIGHTS AND MEASURES. 1: SPECIFICATIONS AND TOLERANCES FOR FIELD STANDARD WEIGHTS (NBS CLASS F)
Thomas M. Stabler Jul. 1972 12 p Revised
(NBS-Handbook-105-1-Rev) Avail: SOD $0.25 as C 13.11:105-1

These specifications and tolerances are recommended as minimum requirements for standards used in the field by state and local weights and measures officials in examination of weighing devices. Author

N72-28501*# Mechanical Technology, Inc., Latham, N.Y.
DESIGN AND FABRICATION OF PROTOTYPE SYSTEM FOR EARLY WARNING OF IMPENDING BEARING FAILURE
J. J. Broderick, R. F. Burchill, and H. L. Clark Jan. 1972 97 p refs
(Contract NAS8-25706)
(NASA-CR-123717; MTI-71TR1) Avail: NTIS HC $7.00 CSCL 13I

Ball bearing performance tests run on several identical ball bearings under a variety of load, speed, temperature, and lubrication conditions are reported. Bearing temperature, torque, vibration, noise, strain, cage speed, etc., were monitored to establish those measurements most suitable as indicators of ball bearing health. Tape records were made under steady-state conditions of a variety of speeds and loads. Sample sections were selected for narrowband spectral analysis with a real time analyzer. An artificial flow was created across the inner race surface of one bearing using an acid etch technique to produce

the scratch. Tape records obtained before and after established a characteristic frequency response that identifies the presence of the flow. The signals found most useful as indicators of performance degradation were ultrasonic outputs. Author

N72-28502*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROCESS FOR PRODUCING NICKEL ALUMINIDE COATING LOW ALLOY STAINLESS STEEL Patent Application
Salvatore J. Grisaffe and Ernest W. Klechka, inventors (to NASA) Filed 19 Jul. 1972 12 p
(NASA-Case-LEW-11267-2; US-Patent-Appl-SN-273223) Avail: NTIS HC $3.00 CSCL 13H

A process is described for coating low alloy austenitic stainless steel to render the steel highly resistant to oxidation corrosion and erosion from exhaust gases in automobile internal combustion engines. The process involves placing a cemetation pack, made up of 96% aluminum oxide, 2% aluminum, 1% soldium chloride, and 1% ammonium bifluoride, on the nickel chromium layer in an inert atmosphere. The cemetation pack is allowed to remain on the nickel chromium layer between 4 and 24 hours at temperatures from 1400 to 1600 F. This process forms an intermetallic chromium containing nickel aluminide that renders the steel highly resistant to erosion and oxidation.
NASA

N72-28503*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AIR CONDITIONING SYSTEM AND COMPONENT THEREFOR: DISTRIBUTING AIR FLOW FROM OPPOSITE DIRECTIONS Patent Application
Henry D. Obler and Hugh B. Bauer, inventors (to NASA) Filed 28 Apr. 1972 23 p
(NASA-Case-GSC-11445-1; US-Patent-Appl-SN-248471) Avail: NTIS HC $3.25 CSCL 13I

An air conditioning system and an automatic air volume control apparatus are presented for distribution of air flow from two opposite directions. The air conditioning system, comprises a plurality of separate air conditioning units coupled to a common supply duct such that air may be introduced into the supply duct in two opposite flow directions. A plurality of outlets, such as registers or auxiliary or branch ducts, communicate with the supply duct. Valve means are located in the supply duct at at least some of the outlets for automatically channelling a controllable amount of air from the supply duct to the associated outlet regardless of the direction of air flow within the supply duct. The control apparatus is composed of: (1) a first air scoop located in the supply duct that deflects air toward an outlet, (2) a second air scoop located in the air duct that deflects air away from the air outlet, and (3) a freely swinging movable vane that channels the air flow with that highest relative pressure into the associated outlet. NASA

N72-28504*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN ANALYSIS FOR A NUTATING PLATE DRIVE 4
Stuart H. Loewenthal and Dennis P. Townsend 1972 13 p Prosposed for presentation at Mech. Conf. and Intern. Symp. on Gearing and transmissions, San Francisco, 8-12 Oct. 1972; sponsored by ASME and AM. Gear MFR. Assoc.
(NASA-TM-X-68117; E-7050) Avail: NTIS HC $3.00 CSCL 13I

A simplified design analysis was conducted on a nutating plate type drive system for a 2500 horsepower helicopter main rotor gear box. A drive system that split the output torque evenly between two nutating plates for the purpose of reducing the load on each nutating plate was analyzed. Needle bearings were used on the nutating plate pins. The results of the analysis indicate that the required load capacity of the pin bearings and the speed of the nutating plate bearings were beyond the state-of-the-art capacity of rolling-element bearings. The analysis further indicates that the nutating plate drive is less efficient, and results in a higher weight per horsepower than a conventional planetary helicopter transmission with similar design specifications. Author

N72-28505*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARATIVE LUBRICATION STUDIES OF OH-58A TAIL ROTOR DRIVE SHAFT BEARINGS
Marshall W. Dietrich, Richard J. Parker, and Erwin V. Zaretsky Jul. 1972 34 p refs
(NASA-TM-X-68118; E-7054) Avail: NTIS HC $3.75 CSCL 11H

Comparative lubrication tests were run with OH-58A helicopter tail rotor drive shaft bearings. The tests were run in an outdoor environment with ambient temperatures ranging from 10 to 75 F. Dust was periodically applied to the bearings to simulate field conditions. The cause of bearing failure was associated with dust penetration. Rotor shaft failure was found to be caused by the shaft rotating in the standard rubber collar due to seizure of the bearings. Bearings with a positive rubbing seal having a MIL-G-81322 grease produced lives greater than with bearings having labyrinth seals and a mineral oil paste lubricant. An elongated collar prevented failure of the rotor shaft during bearing seizure. In a limited test, installation of tail boom shrouds over the bearings which excluded dust and water resulted in bearing lives in excess of 1800 hours or 1200 hours greater than the current 600 hours TBO, regardless of the lubricant-bearing combination used. Author

N72-28506*# Naval Research Lab., Washington, D.C. Ocean Materials Criteria Branch.
CHARACTERIZATION OF GTA WELDMENTS IN 10Ni-8Co-2Cr-1Mo STEEL
F. R. Stonesifer and H. L. Smith Jun. 1972 36 p refs
(NASA Order C-54542-B)
(NASA-CR-127693; NRL-MR-2466) Avail: NTIS HC $4.00 CSCL 13H

This study of 10Ni-8Co-2Cr-1Mo steel includes evaluations of tensile, impact, hardness, fracture toughness properties, and metallographic features. Base plate and three weldments in one-inch thicknesses were examined to compare as-welded properties with those obtained after reaging, and results of welding the 10%Ni alloy with 9-4-20 wire as opposed to a matching weld wire composition. Critical crack sizes are calculated for the material. The most desirable weld properties are obtained using the matching weld wire and a reaging cycle. However, the improvement gained through reaging is probably not sufficient to justify the additional cost for most practical applications. Author

N72-28507*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SCANNING NOZZLE PLATING SYSTEM Patent Application
Gerald D. Oliver, inventor (to NASA) Filed 28 Jun. 1972 17 p (Contract NAS7-100)
(NASA-Case-NPO-11758-1; US-Patent-Appl-SN-266913) Avail: NTIS HC $3.00 CSCL 13H

A plating system is described where a substrate to be plated is supported on a stationary platform. A nozzle assembly with a small nozzle is supplied with a plating solution under high pressure, so that a constant-flow stream of solution is directed to the substrate. The nozzle assembly is moved relative to the substrate at a selected rate and movement pattern. A potential difference (voltage) is provided between the substrate and the solution in the assembly. The voltage amplitude is modulated so that only when the amplitude is above a minimum known value plating takes place. NASA

N72-28508*# Scientific Translation Service, Santa Barbara, Calif.
PROBLEMS IN THE CONSTRUCTION OF WOODWORKING MACHINES
Wolfgang Schmutzler Washington NASA Jul. 1972 24 p ref

Transl. into ENGLISH from Holz Roh. Werkstoff (Berlin), v. 26, no. 7, Jul. 1968 p 237-243
(Contract NASw-2035)
(NASA-TT-F-14398) Avail: NTIS HC $3.25 CSCL 13I

For the construction of modern wood working machines, problems such as the most favorable tool spindle and shaft bearings play an important part. The construction and functional details of these machines are considered. The interrelationships are discussed of speed, bearing load, fit and lubrication, as well as bearing devices and their installation. The particulars of motor shaft bearings are considered along with questions concerning oscillating shafts. Another, equally important construction detail is the chip suction system. Defects that might occur in the construction of suction hoods or at the machines themselves are described. Finally, questions of noise abatement, its cause and elimination are discussed. Author

N72-28509*# Scientific Translation Service, Santa Barbara, Calif.
NOISE ABATEMENT IN WOOD WORKING
W. Schmutzler Washington NASA Jul. 1972 16 p refs
Transl. into ENGLISH from Hole Roh- Werkst. (West Germany), v. 25, no. 4, Apr. 1967 p 130-134
(Contract NASw-2035)
(NASA-TT-F-14399) Avail: NTIS HC $3.00 CSCL 13H

Manufacturers and users of machines are held by regulation and law to consider certain definite maximum values for noise in factories and workshops. On machines with cutting spindles, the sound intensity rises with the fourth power of spindle speed. Addition of ten equally noisy sound sources increases the total sound level by 10 dB. The main object in noise abatement is elimination of the noise source by design changes at the tool and the surrounding table and pressure lips. The propagation of noise is inhibited by attenuation of sound traveling through air and solids as well as by sound damping. Author

N72-28510# National Research Council of Canada, Ottawa (Ontario).
MEASUREMENT OF RADIANT POWER AT WELDING PROCESSES AND CONSEQUENCES FOR EYE PROTECTION AGAINST IR RADIATION.
H.-J. Huebner, E. Sutter, and K. Wicke 1972 23 p refs
Transl. into ENGLISH from Optik (Stuttgart), V. 31, no. 5, 1970 p 462-476
(NRC-TT-1563) Avail: NTIS HC $3.25

The spectral irradiances produced by different welding processes are measured in the wavelength range from 0.4 to 2.0 micrometer. These figures are compared with the irradiance caused by solar radiation on the earth in order to calculate the transmission factor of welding filters in the infrared, preserving the eye from damage. The maximum permission factors of IR filters are calculated on the basis of the spectral distribution of a black body. All these values are much smaller than those allowed up to now. Author

N72-28511*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
OIL-FILM-PARAMETER INVESTIGATION
Edward P. Kingsbury Apr. 1972 58 p refs
(Contract NAS9-4065; DSR Proj. 55-23829)
(NASA-CR-115746; E-2650) Avail: NTIS HC $5.00 CSCL 11H

A counter rotating fixture was designed and built to measure starved EHD film thicknesses. Some good geometry glass races were obtained. A theoretical analysis of starvation was made. Measurements of retainer stability during bimode torque disturbances were made. The most common form of bimode was related to stability of retainer cock. Author

N72-28512*# Stanford Research Inst., Menlo Park, Calif.
INVESTIGATION OF FAILURE MECHANISMS IN INTEGRATED VACUUM CIRCUITS
A. Rosengreen Aug. 1972 56 p refs
(Contract NAS1-10815; SRI Proj. PYU-1257)
(NASA-CR-112108) Avail: NTIS HC $5.00 CSCL 14D

The fabrication techniques of integrated vacuum circuits are described in detail. Data obtained from a specially designed test circuit are presented. The data show that the emission observed in reverse biased devices is due to cross-talk between the devices and can be eliminated by electrostatic shielding. The lifetime of the cathodes has been improved by proper activation techniques. None of the cathodes on life test has shown any sign of failure after more than 3500 hours. Life tests of triodes show a decline of anode current by a factor of two to three after a few days. The current recovers when the large positive anode voltage (100 V) has been removed for a few hours. It is suggested that this is due to trapped charges in the sapphire substrate. Evidence of the presence of such charges is given, and a model of the charge distribution is presented consistent with the measurements. Solution of the problem associated with the decay of triode current may require proper treatment of the sapphire surface and/or changes in the deposition technique of the thin metal films. Author

N72-28513*# Planning Research Corp., Los Angeles, Calif.
DEVELOPMENT OF KSC PROGRAM FOR INVESTIGATING AND GENERATING FIELD FAILURE RATES. RELIABILITY HANDBOOK FOR GROUND SUPPORT EQUIPMENT Final Report
Charles E. Bloomquist and Richard H. Kallmeyer 24 May 1972 391 p refs
(Contract NAS10-7621)
(NASA-CR-127580; PRC-R-1459; GP-975) Avail: NTIS HC $21.75 CSCL 14D

Field failure rates and confidence factors are presented for 88 identifiable components of the ground support equipment at the John F. Kennedy Space Center. For most of these, supplementary information regarding failure mode and cause is tabulated. Complete reliability assessments are included for three systems, eight subsystems, and nine generic piece-part classifications. Procedures for updating or augmenting the reliability results are also included. Author

N72-28514# Wisconsin Univ., Milwaukee.
BEHAVIOR OF WELDED JOINTS IN STAINLESS AND ALLOY STEELS AT ELEVATED TEMPERATURES. AN INTERPRETIVE REPORT OF THE AVAILABLE DATA
R. G. Gilliland 30 Jun. 1971 51 p refs
(Contract AT(40-1)-4076)
(ORO-4076-1) Avail: NTIS

Results of a literature search on properties of weldments in Types 304 and 316 stainless steel and Croloy are presented. Data tables are included on stress rupture, ductility, tensile strength, and yield strengths. NSA

N72-28515# Midwest Research Inst., Kansas City, Mo.
AN ANALYTICAL INVESTIGATION OF THREE RACE-RETAINER INTERFACE CONFIGURATIONS FOR A 100 mm BORE BALL BEARING Technical Report, Sep. 1970 - Nov. 1971
Ronald D. Dayton Feb. 1972 55 p refs
(Contract F33615-69-C-1265; AF Proj. 3048)
(AD-739995; AFAPL-TR-72-5) Avail: NTIS CSCL 13/9

The report presents an analytical investigation of three race-retainer interface configurations (smooth, partially grooved and fully grooved) for a 100-mm bore ball bearing geometry. These analyses were performed in an effort to optimize the inner-race-retainer interface configuration from the standpoint of increasing hydrodynamic load-carrying capacity, increasing lubricant availability (flow rate), enhancing retainer stability and minimizing frictional torque. Values of these parameters were determined for each of the three interface configurations at five different bearing speeds, at three different radial clearances between the retainer and bearing inner-race, and at five different values of eccentricity ratio for the race-retainer combination. For

the fully grooved configuration only, the effects of groove angle and groove depth were investigated. Of the three configurations investigated, the smooth configuration was found to provide the most satisfactory bearing performance. In terms of offering the most hope for increasing bearing performance, the fully grooved configuration appeared to be most suitable. Author (GRA)

N72-28516# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
TRANSTAGE ACS VALVE STORAGE TESTS
Garreth J. Gunderson Jan. 1972 54 p
(AD-739882; AFRPL-TR-72-14) Avail: NTIS CSCL 13/11

The Transtage attitude control valves (Moog, Inc., series redundant, monopropellant Model No. 60-315A) are presently being subjected to a 5-year storage test to determine performance degradation versus storage time. The report covers the results of repeat baseline water-flow testing (after 3 years ambient storage) on three of the original nine valves. It also includes the test results in gaseous nitrogen of four additional valves after their third year of storage in the overall 5-year ambient storage period. Tests were conducted to determine pressure-drop/water-flow characteristics, pull-in/drop-out current, response, and internal/external leakage. Author (GRA)

N72-28517# Oklahoma State Univ., Stillwater. Fluid Power Research Center.
HYDRAULIC SPECIFICATION PROGRAM ON PHASE 2 Annual Report, 1 Oct. 1970 - 30 Sep. 1971
Dec. 1971 432 p refs
(Contract DAAK02-71-C-0074)
(AD-737730; OSU-FP-111) Avail: NTIS CSCL 13/7

The purpose of the OSU-MERDC hydraulics specifications program is to develop industrially acceptable test procedures and requirement specifications relative to the performance of hydraulic components and systems to facilitate the military's buy commercial approach. Although the program was aimed toward components and systems for future 3000 psi operating pressure levels, it is intended that the test procedures be applicable to any pressure level. The objective is not only to establish acceptable standards for appraising component performance but also to be able to predict the influence of the components on the overall system. Author (GRA)

N72-28518# Pratt and Whitney Aircraft, East Hartford, Conn.
ADVANCED SEAL TECHNOLOGY Final Report, 30 Apr. - 30 Nov. 1971
Frederic H. Mahler Wright-Patterson AFB, Ohio AFAPL Feb. 1972 175 p refs
(Contract F33615-71-C-1534; AF Proj. 3066)
(AD-739922; PWA-4372; AFAPL-TR-72-8) Avail: NTIS CSCL 11/1

The limitations of present aircraft gas turbine engine dynamic seal technology were reviewed and the effect of gas path seal losses on four representative current and advanced transport and fighter aircraft engine cycles was established. Four key seal locations were identified: high-pressure compressor blade tip seal; cantilevered compressor stator tip seal; high-pressure turbine blade tip seal; and turbine interstage seal. An evaluation of a variety of seal concepts and preliminary designs yielded four candidate seal concepts for operation in environments up to 1500 F compressor discharge temperature, 3200 F turbine inlet temperature, 600 psi maximum pressure and rotor speeds consistent with advanced engine cycles. Final design layouts were prepared for the two most promising of these seals: a free-floating composite/abradable compressor blade tip seal and a high-pressure turbine blade tip seal using integrally cost extensions of the second-stage vane platform as first-and second-stage blade tip rubstrips. Finally, recommendations for experimental evaluation of the two final seal designs were developed. Author (GRA)

N72-28519# Battelle Memorial Inst., Columbus, Ohio.
THE 30000 rpm VANE PUMP DEMONSTRATION Final Report, 16 Dec. 1968 - 30 Nov. 1971
David L. Thomas, J. Philip Dechow, Robert K. Catterson, Harry T. Johnson, Robert K. Mitchell, and John P. Wilcox Wright-Patterson AFB, Ohio AFAPL Mar. 1972 160 p refs
(Contract F33615-69-C-1302; AF Proj. 3145)
(AD-739936; AFAPL-TR-72-9) Avail: NTIS CSCL 13/11

The purpose of this project was to demonstrate the capability of new vane-pump concepts to meet future aircraft requirements. The specific objective was the development of a pressure-compensated hydraulic pump that would deliver 45 gpm at 4000 psi while operating at 30,000 rpm with MIL-H-5606B hydraulic fluid. The concepts were the product of a previous Air Force program and included a pivoting-tip vane for hydrodynamic load support and a two-lobed deformable cam ring for variable displacement. In critical experiments, pivoting-tip vanes were operated satisfactorily at the rated conditions of temperature, speed, and pressure. A pump with solid cam rings was operated a total of 27.6 hours at 30,000 rpm and 0.4 hours at 3300-psi discharge pressure. The pump with deformable cam rings was operated a total of 62 hours including 9.4 hours at 25,000 rpm, 10.6 hours at 30,000 rpm, and 1 hour at 3000-psi discharge pressure. A pressure compensator with inherent temporary droop was conceived, and laboratory development was started. Continued development is recommended to correct deformable-cam-ring deficiencies to enable determination of pump efficiency and durability. Author (GRA)

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid State.

N72-28520 National Lending Library for Science and Technology, Boston Spa (England).
MACHINING OF MATERIALS BY MEANS OF LASER BEAMS
G. Pahlitzsch and U. Eisleben 29 Feb. 1972 15 p refs Transl. into ENGLISH from Z. Wirt. Fert. (West Germany), no. 66, 1971 p 277-283 In ENGLISH and GERMAN
(NLL-Trans-746-1111-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Two ruby lasers, differing in the mirror systems, were used in an investigation of material machining. Machining results are presented for studies with and without apertures, and the penetration period is discussed for 28 different metals. The influence of impulse duration on the depth of the hole which can be produced in different materials is considered. K.P.D.

N72-28521* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MASER FOR FREQUENCIES IN THE 7-20 GHz RANGE Patent
Robert C. Clauss and Rex B. Quinn, inventors (to NASA) Issued 11 Jul. 1972 7 p Filed 11 Aug. 1970 Supersedes N71-33023 (09 - 20, p 3281) Sponsored by NASA
(NASA-Case-NPO-11437; US-Patent-3,676,787;
US-Patent-Appl-SN-63144; US-Patent-Class-330-4;
US-Patent-Class-331-94) Avail: US Patent Office CSCL 20E

A traveling wave maser (TWM) of the comb-type is disclosed for operation in the 7 to 20 GHz frequency range. The TWM is loaded with 0-degree Czochralski-grown ruby with its c axis at angle theta = 90 deg with respect to the magnetic field. The TWM is pumped in the push-push mode between levels 1-3 and 3-4 with two different frequencies.
Official Gazette of the U.S. Patent Office

N72-28522*# Yale Univ., New Haven, Conn.
PART 1: CLASSICAL LASER. PART 2: THE EFFECT OF VELOCITY CHANGING COLLISIONS ON THE OUTPUT OF

A GAS LASER Ph.D. Thesis
Matthew Borenstein 1972 208 p refs
(Grants NGR-07-004-035; AF-AFOSR-1324-67)
(NASA-CR-127680) Avail: NTIS HC $12.50 CSCL 20E

A classical model for laser action is discussed, in which an active medium consisting of anharmonic oscillators interacts with an electromagnetic field in a resonant cavity. Comparison with the case of a medium consisting of harmonic oscillators shows the significance of nonlinearities for producing self-sustained oscillations in the radiation field. A theoretical model is presented for the pressure dependence of the intensity of a gas laser, in which only velocity-changing collisions with foreign gas atoms are included. A collision model for hard sphere, repulsive interactions was derived. Collision theory was applied to a third-order expansion of the polarization in powers of the cavity electric field (weak signal theory). Author

N72-28523# Aeronautical Research Labs., Melbourne (Australia).
SOME INITIAL EXPERIMENTS WITH TIME-AVERAGED HOLOGRAPHY TO DETERMINE DYNAMICAL PROPERTIES OF VIBRATING PANELS
N. B. Joyce, C. M. Bailey, and T. J. Struys Mar. 1972 19 p refs
(ARL/SM-Note-375) Avail: NTIS HC $3.00

The response to single-point excitation of a skew panel was observed using time-averaged holography, at frequencies in a region of nearly coincident natural frequencies. Author

N72-28524# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
A COMPARATIVE STUDY OF LASER METHODS OF AIR POLLUTION MAPPING
R. M. Measures Dec. 1971 47 p refs
(UTIAS-174) Avail: NTIS HC $4.50

A comparative study was made of three laser methods of remotely mapping gaseous pollutants in the atmosphere. It was found that, in the case of NO2 and SO2, differential absorption and scattering have superior performance potential with regard to range and sensitivity than either laser-induced fluorescence or Raman backscattering. An analysis of the fluorescence return expected from a local source of NO2 indicated that a plume of about 10 ppm could be detected at a range of several kilometers. Author

N72-28525# Defence Standards Labs., Maribyrnong (Australia).
PREPARATION OF GOLD COATED STAINLESS STEEL REFLECTING SURFACES FOR USE AS LASER OPTICAL COMPONENTS FOR 10.6 MICRONS RADIATION
J. Allen May 1972 9 p
(TN-248) Avail: NTIS HC $3.00

The methods of preparing the surfaces of laser optical components capable of withstanding CO2 laser beams operating with a power rating of 2kW at wavelength 10.6 microns are described. High-purity gold has been evaporated on to optically polished stainless steel substrates to produce components, which when prepared and maintained using the techniques described have a working life under laboratory experimental conditions of the order of 12 months. At this time tests have been successfully carried out in pulsed systems having an energy rating of 15 kilo joules per square meter. Author

N72-28526# Defense Documentation Center, Alexandria, Va.
INFRARED LASERS Report Bibliography, Dec. 1961 - Dec. 1971
Apr. 1972 175 p refs
(AD-739900; DDC-TAS-72-4) Avail: NTIS CSCL 20/5

The bibliography deals with lasers operating in the infrared regions. Different types of molecular lasers are discussed with their frequencies. There are references on tunable lasers for air pollution detection, carbon dioxide lasers for 10.6 micron bands, monoxide lasers, chemical lasers, as well as references on techniques of lasing. Included are Corporate Author-Monitoring Agency, Subject, Title, and Personal Author Indexes. Author (GRA)

N72-28527# Aerospace Corp., El Segundo, Calif. Lab. Operations.
PERFORMANCE OF CW HF CHEMICAL LASER WITH N2 OR He DILUENT Technical Report, Apr. - Sep. 1970
Donald J. Spencer, Harold Mirels, and Donald A. Durran 15 Mar. 1972 39 p refs
(Contract F04701-71-C-0172)
(AD-739927; TR-0172(2777)-1; SAMSO-TR-72-55) Avail: NTIS CSCL 20/5

Recent experimental results on the performance of a continuous HF (or DF) chemical laser are reported. In this device, an arc-heated diluent is mixed in a plenum with SF6 to provide F atoms. The mixture is expanded to form a supersonic jet into which H2 (or D2) is diffused. Population inversion and lasing are due to the reaction H2 + F = HF(v) + H. Power levels above 1 kW were obtained in a N2 diluent gas flow, and levels above 1.7 kW were obtained in a He diluent gas flow. Specific power yields are 43 kW sec/lb and 108 Kw sec/lb for the N2 and He systems, respectively. The variation of laser power and efficiency with cavity optical axis location and SF mass flow are reported for both N2 and He systems. A spectrum of the HF laser operating in a He flow is also presented. Author (GRA)

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N72-28528 National Lending Library for Science and Technology, Boston Spa (England).
TEMPERATURE DEPENDENCE OF THE LATTICE PARAMETER AND COEFFICIENT OF THERMAL EXPANSION OF Cu-Al ALPHA ALLOYS
T. I. Babyuk, O. I. Rybailo, G. P. Kushta, and A. I. Soltysik [1971] 11 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chernaya Met. (Moscow), no. 9, 1971 p 118-121
(NLL-M-21253-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Temperature dependencies a(T) and lambda (T) were obtained for Cu-Al alloys containing up to 15 percent Al in the temperature range 20 to 700 C. The contributions of the anharmonic terms phi sub 3, phi sub 5 and phi sub 7 in thermal expansion are assessed, and the redistribution of the contributions was established with an increase in concentration of aluminum. Author

N72-28529 National Lending Library for Science and Technology, Boston Spa (England).
THE EFFECT OF REVERSION AND RECRYSTALLISATION ON THE MECHANICAL PROPERTIES OF NIOBIUM DURING SHORT-TERM HEATING
I. N. Kidin, V. V. Medvedev, and B. V. Mochalov [1971] 6 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chernaya Met. (Moscow), no. 9, 1971 p 126-128
(NLL-M-21254-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Grade NVCh pure niobium was studied in the cold-worked state (lambda = 90%). In the time range to rupture of 1 to 60 secs. a difference was observed between the values for short-term heat resistance for heating rates of 1 and 10 deg/sec, due to the differing degree of softening on heating to test temperature from reversion and recrystallisation. In the cold-worked state, despite the rapid softening due to reversion, the strength

attained through cold working is retained during short-term heating. Author

N72-28530 National Lending Library for Science and Technology, Boston Spa (England).
THE NEW G13F STEEL WITH HIGH WEAR-RESISTANCE
N. P. Nikolaichik, A. I. Karmazin, G. P. Khmel, S. E. Tkachev, and E. N. Nikolaichik [1971] 5 p Transl. into ENGLISH from Stal (Moscow), no. 9, 1971 p 842
(NLL-M-21235-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Alloying G13 steel with vanadium, with the optimum ratio of vanadium to carbon (up to 0.25 to 0.45 percent V with the carbon content at the same time increased to 1.2 to 1.35 percent) improves its wear resistance by 80 percent. If the G13F steel contains 0.50 to 0.65 percent V and the upper limiting amount of carbon (1.35 to 1.45 percent), its wear resistance is almost double that of the G13 steel. The G13F steel can be used in either the cast or the deformed states. The forging of this steel is commenced at 1200 C (it must be held at temperature for long enough for all the binary carbides of manganese to be dissolved and the carbides of vanadium partially dissolved), and forging ends at 900 C. When the steel is quenched, it has a satisfactory combination of plastic and strength properties. Author

N72-28531 National Lending Library for Science and Technology, Boston Spa (England).
THE CREEP PROPERTIES OF NON-FERROUS METALS
W. Ruttmann 29 Feb. 1972 9 p Transl. into ENGLISH from Werkstoffe Korrosion (Weinheim), v. 21, 1970 p 374-377 In GERMAN and ENGLISH
(NLL-Trans-746-1131-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The creep properties of nonferrous heavy metals, light alloys, and special metals were determined. Data include elongation, area reductions, temperature effects, and strength. E.H.W.

N72-28532 National Lending Library for Science and Technology, Boston Spa (England).
INTERNAL STRESSES IN ELECTRODEPOSITED NICKEL-CONTAINING SiC AND A L203 PARTICLES AND THEIR INFLUENCE ON THE FATIGUE STRENGTH OF Ck 45 STEEL
E. Broszeit, G. Heinke, and H. Wiegand 29 Feb. 1972 10 p refs Transl. into ENGLISH from Metall. (West Germany), no. 25, Oct. 1971 p 1110-1114 In ENGLISH and GERMAN
(NLL-Trans-746-1115-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The strength and wear properties of electrodeposited nickel containing Al203 and SiC particles are discussed. Internal stresses of the first and higher orders and particle size are considered. The results of fatigue studies are also presented. K.P.D.

N72-28533 National Lending Library for Science and Technology, Boston Spa (England).
STUDY OF THE EFFECTS OF THE STRUCTURE ON THE CORROSION-RESISTANCE OF WELDS IN LOW-CARBON 18/10-M0 STEEL (TYPE 316L)
C. Leymonie 4 Apr. 1972 33 p refs Transl. into ENGLISH from Rev. Met. (Paris), no. 68, 1971 p 289-302 In ENGLISH and FRENCH Presented at the Soc. Franc. de Met. Fall Conf. on Met., 1970
(NLL-LTI-746-1062-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 4 NLL photocopy coupons

Type 316L steel sheets welded with coated electrodes were selected so that the deposits contained initially 0, 5 and 10 percent ferrite. After heat treatment of 60, 100 and 1000 hours at 550, 650 and 750 C, the change in structure of the sheets and welds was studied by measurements of magnetic permeability and impact strength in Huey and Strauss-Indret corrosion tests. Sensitization at 550 C, even for long periods, brought the introduction of carbides as sources of intercrystalline dechromization. The influence of the ferrite content on corrosion was substantially absent. Sensitization at 750 C, or for long periods at 650 C, brought about a hazard of corrosion by sigma phase, produced either by transformation of delta ferrite or by that of austenite. Provided that the ferrite content is sufficient (at least 5 percent) and the carbon content low, the effects of heat treatments on the corrosion resistance of welds should not be exaggerated. Author

N72-28534 National Lending Library for Science and Technology, Boston Spa (England).
MECHANICAL PROPERTIES AND WELDABILITY OF NITROGEN-BEARING AUSTENITIC STEELS
Alfred Randak, Wilhelm Wessling, Hans Elmar Bock, Helmut Steinmaurer, and Lothar Faust 4 Apr. 1972 28 p refs Transl. into ENGLISH from Stahl Eisen (Duesseldorf), no. 91, 1971 p 1255-1270 In ENGLISH and GERMAN
(NLL-Trans-746-1189-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

Results of tensile tests at room temperature and at elevated temperatures carried out on austenitic steels, with and without molybdenum containing about 18 percent Cr and 10 percent Ni, depended on nitrogen content in the range of about 0.10 to 0.20 percent as well as on the shape and dimensions of the product. Impact behavior of the nitrogen steels at low temperatures down to -269 C and creep behavior at elevated temperatures of up to 650 C were observed. Results on welding behavior and mechanical properties of the welded joints considered the use of filler materials with and without ferrile and of different welding processes. Author

N72-28535* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPARATUS FOR PRODUCING METAL POWDERS Patent
Alan Arias, inventor (to NASA) Issued 11 Jul. 1972 5 p Filed 25 Jun. 1971 Supersedes N72-11433 (10 - 02, p 0207) Continuation-in-part of US Patent Appl. SN-156778, filed 28 Aug. 1969
(NASA-Case-XLE-06461-2; US-Patent-3,675,910; US-Patent-Appl-SN-156778; US-Patent-Class-266-24; US-Patent-Appl-SN-853855) Avail: US Patent Office CSCL 11F

The invention described produces metal powders of controlled particle size by reducing oxides with the vapor of a reactive metal in a vacuum. The particle size of the resulting powder is determined by the temperature at which the reactions take place. The higher the reaction temperature, the larger the particle size of the metal powder. In addition, the longer the powder is held at temperature, the larger the particle size. If the reaction is permitted to become self-sustaining because the reactions are exothermic close control of the particle size is no longer feasible. P.N.F.

N72-28536* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REFRACTORY METAL BASE ALLOY COMPOSITES Patent
Max Quatinetz, John W. Weeton, and Thomas P. Herbell, inventors (to NASA) Issued 11 Jul. 1972 4 p Filed 24 Jan. 1969 Continuation-in-part of US Patent Appl. SN-539255, filed 25 Mar. 1966
(NASA-Case-XLE-03940-2; US-Patent-3,676,084; US-Patent-Appl-SN-793657; US-Patent-Class-29-182.5; US-Patent-Appl-SN-539255) Avail: US Patent Office CSCL 11F

A procedure for obtaining improved distribution of refractory compounds and micro-constituents in a refractory metal matrix is described. The advantages of the system over conventional methods of metal matrix production are presented. The procedure involves the use of a powder metallurgical process in which refractory compounds are mechanically mixed with refractory

metal powders, with or without attrition or grinding. This is followed by a densification or consolidation procedure which includes cold compaction and sintering or hot pressing. P.N.F.

N72-28537*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
THERMAL CONDUCTIVITY, ELECTRICAL RESISTIVITY, AND THERMOPOWER OF AEROSPACE ALLOYS FROM 4 TO 300 K. 6: Fe-22Cr-13Ni-5Mn STAINLESS STEEL
J. G. Hust and L. L. Sparks 28 Jul. 1971 41 p refs
(NASA Order W-13300; NBS Proj. 27503-2750430)
(NASA-CR-127683; NBS-9799) Avail: NTIS HC $4.25 CSCL 11F

The equipment and techniques for determining the thermal conductivity, electrical resistivity Lorenz ratio, and thermopower characteristics of Fe-22Cr-13Ni-5Mn stainless steel are discussed. The dimensions of the specimen and its preparation are described. The experimental data are represented by arbitrary functions over the entire range and smooth tables are generated from these functions. Author

N72-28538# Metaalinstituut TNO, Delft (Netherlands).
EXAMINATION OF TWO 25 POUND GUN BARRELS [ONDERZOEK VAN TWEE 25 PND. SCHIETUIZEN]
T. P. R. Regenboog 4 May 1971 19 p In DUTCH
(M71/07/38-REG/VVE) Avail: NTIS HC $3.00

The enlargement of exterior diameters on two gun barrel models with structural damage of their interior surface was studied by optical, structural, and mechanical methods. Measured external diameter enlargements were about 1 mm and 0.5 mm, respectively. Results of hardness measurements and warp studies showed that the structural materials as such are not responsible for the enlargement and that the causes are related to metallurgical problems. Transl. by G.G.

N72-28539# National Bureau of Standards, Boulder, Colo. Inst. for Basic Standards.
STANDARD REFERENCE MATERIALS: THE EDDY CURRENT DECAY METHOD FOR RESISTIVITY CHARACTERIZATION OF HIGH PURITY METALS
A. F. Clark, V. A. Deason, J. G. Hust, and R. L. Powell May 1972 55 p refs
(NBS-SP-260-39) Avail: SOD $0.55 as C13. 10:260-39

Characterization of high purity metals by resistivity measurements at low temperatures is discussed. In particular, the eddy current decay method of resistivity measurement is described in detail. The advantages and limitations are presented along with the theoretical basis of the method. Detailed instructions are given for constructing and operating the apparatus. Author

N72-28540# Technische Hogeschool, Delft (Netherlands).
THE GOLD NICKEL PLATINUM SYSTEM Ph.D. Thesis [HET SYSTEEM Au-Ni-Pt]
Simon Markus Carmio 7 Jun. 1972 75 p refs In DUTCH
Avail: NTIS HC $5.75

The system Au-Ni-Pt (X-Y-Z) is described using a number of isothermal intersections in the temperature range 812 - 1260 C. These intersections are computed by means of sub-regular approximation, in which the energetic interaction in each binary phase is characterized by two parameters. For the system Au-Ni-Pt the following was found: (1) The miscibility in the solid state between gold and nickel and between gold and platinum is impaired by the addition of platinum or nickel respectively; (2) the critical temperatures in the systems Au-Ni and Au-Pt are increased by the third component; and (3) owing to the occurrence of three phase equilibria between a liquid and two solid solutions the temperature maximum of the curve through the critical points is not stable. Author

N72-28541# Technische Hogeschool, Delft (Netherlands).
THE PORTEVIN-LE CHATELIER EFFECT IN GOLD COPPER ALLOYS Ph.D. Thesis [HET PORTEVIN-LE CHATELIER EFFECT IN GOUD-KOPER LEGERINGEN]
Adolf Wijler 30 May 1972 136 p refs In DUTCH
Avail: NTIS HC $9.00

Three different aspects of the Portevin-le Chatelier (PL) effect in tensile experiments on gold-copper alloys are studied: (1) the interaction between the moving dislocations and the impurity atoms; (2) the consequence of the atomic effects: the fact that the plastic deformation becomes inhomogeneous in a limited range of temperature and deformation bands propagate along the specimen; and (3) the relations between stress, strain and strain rate as prerequisites for the occurrence of the PL effect. Author

N72-28542*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF HEAT TREATING A FORMED POWDER PRODUCT MATERIAL Patent Application
John C. Freche, William J. Waters, and Richard L. Ashbrook, inventors (to NASA) Filed 28 Jun. 1972 11 p
(NASA-Case-LEW-10805-3; US-Patent-Appl-SN-266928) Avail: NTIS HC $3.00 CSCL 11F

Heat treating a product material of prealloyed powders after shaping by superplastic deformation restores the ability of the material to resist deformation at high temperatures. Heat treating is accomplished by heating to a temperature between the solidus and liquidus with the application of isostatic pressure to close any voids. This pressure may be simultaneously applied while the material is at the heat treating temperature. The pressure may also be applied when the material cools to a temperature between that at which it is shaped and the solidus. NASA

N72-28543*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEVITRIFICATION AND SHRINKAGE BEHAVIOR OF SILICA FIBERS
Isidor Zaplatynsky Washington Jul. 1972 23 p refs
(NASA-TN-D-6891; E-6900) Avail: NTIS HC $3.00 CSCL 11D

Devitrification and shrinkage of three batches of silica fibers were investigated in the temperature range of 1200 to 1350 C. Fibers with high water and impurity content devitrified rapidly to cristobalite and quartz and exhibited rapid, but the least amount of, shrinkage. A batch with low water and impurity content devitrified more slowly to cristobalite only and underwent severe shrinkage by the mechanism of viscous flow. A third batch of intermediate purity level and low water content devitrified at a moderate rate mainly to cristobalite but shrunk very rapidly. Completely devitrified silica fibers did not exhibit any further shrinkage. Author

N72-28544*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CYCLIC OXIDATION OF COBALT-CHROMIUM-ALUMINUM-YTTRIUM AND ALUMINIDE COATINGS ON IN-100 AND VIA ALLOYS IN HIGH VELOCITY GASES
Daniel L. Deadmore Washington Jul. 1972 36 p refs
(NASA-TN-D-6842; E-6809) Avail: NTIS HC $3.00 CSCL 11F

Embedded-alumina-particle aluminide (EAPA) coated and CoCrAlY coated IN-100 and NASA-TRW-VIA specimens were cyclically oxidation tested in a high velocity (approximately Mach 1) gas flame at 1093 C (2000 F). The EAPA coatings on both alloys performed very similarly to commercial pack aluminide coatings with respect to weight change and thermal fatigue cracking. The CoCrAlY coating on IN-100 had weight changes similar to commercial pack aluminide coatings but no thermal fatigue cracks appeared at 300 hours. The CoCrAlY coating on VIA performed significantly better than the commercial aluminide coatings, providing oxidation protection (based on weight change) to 450 hours and thermal fatigue crack prevention to at least 600 hours. Author

N72-28545*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MATERIAL AND STRUCTURAL STUDIES OF METAL AND POLYMER MATRIX COMPOSITES
Robert A. Signorelli, Tito T. Serafini, and Robert H. Johns 1972 23 p refs Proposed for presentation at Symp. on Impact of Composite Mater. on Aerospace Vehicles and Propulsion Systems, Toulouse, 20-22 Sep. 1972; Sponsored by the Advisory Group for Aerospace Res. and Develop.
(NASA-TM-X-68101; E-7020) Avail: NTIS HC $3.25 CSCL 11F

The application of fiber composites to aeronautical and space vehicle systems indicates the following: It appears quite probable that resin/fiber composites can be developed for service at 315 C for several thousand hours and at 370 C for a few hundred hours. The retention of resin/fiber strength at these high temperatures can be achieved by modifying the polymer molecular structure or by developing new processing techniques, or both. Carbon monofilament with attractive strength values has been produced and fabrication studies to reinforce aluminum with such monofilaments have been initiated. Refractory wire-superalloy composites have demonstrated sufficiently high strength and impact values to suggest that they have potential for application to turbine blades at temperatures to 1200 C and above. Author

N72-28546*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
CORROSION STUDY OF BARE AND COATED STAINLESS STEEL
J. D. Morrison Washington Jul. 1972 64 p refs
(NASA-TN-D-6519) Avail: NTIS HC $3.00 CSCL 11F

A program was conducted at Kennedy Space Center from February 1968 to February 1971 to evaluate the performance of austenitic stainless steel alloys used in fluid systems lines. For several years, there had been numerous failures of stainless steel hardware caused by pitting and stress corrosion cracking. Several alloys were evaluated for effectiveness of certain sacrificial-type protective coverings in preventing corrosion failures. Samples were tested in specially designed racks placed 91 meters (100 yards) above high-tide line at Cape Kennedy. It is concluded that: (1) unprotected tubing samples showed evidence of pitting initiation after 2 weeks; (2) although some alloys develop larger pits than others, it is probable that the actual pitting rate is independent of alloy type; (3) the deepest pitting occurred in the sheltered part of the samples; and (4) zinc-rich coatings and an aluminum-filled coating have afforded sacrificial protection against pitting for at least 28 months. It is believed that a much longer effective coating life can be expected. Author

N72-28547# Aeronautical Research Labs., Melbourne (Australia).
THE ALUMINUM-RICH CORNER OF THE Al-Mg-Ag PHASE DIAGRAM
B. E. Williams Apr. 1972 15 p refs
(ARL/Met-Note-80) Avail: NTIS HC $3.00

The structures of aluminum-rich alloys of the Al-Mg-Ag system were studied by X-ray diffraction. Five intermetallic compounds were identified and lattice parameter measurements of the matrix were made on about 20 specimens. Isothermal sections of the aluminum-rich corner of the phase diagram at 200 C and 500 C were constructed. Author

N72-28548# Iowa State Univ. of Science and Technology, Ames.
ELECTROTRANSPORT OF CARBON, NITROGEN, AND OXYGEN IN ZIRCONIUM M.S. Thesis
Carl Emil Swanson, Jr. Apr. 1972 59 p refs
(Contract W-7405-eng-82)
(IS-T-514) Avail: NTIS

From electrotransport studies the mobilities, effective charges, and diffusion coefficients of carbon, nitrogen, and oxygen in beta zirconium were determined at 1625, 1700, and 1800 C. In conjunction with this investigation the specific resistivity and solid solubility of carbon in beta zirconium were also determined as a function of temperature. Efforts to purify zirconium by electrotransport were limited by the low mobility of carbon. Attempts to prepare zirconium metal with a low carbon content by the van Arkel process for use in subsequent electrotransport purification experiments are described. Author (NSA)

N72-28549# Scientific Translation Service, Ann Arbor, Mich.
STUDY OF URANIUM-TITANIUM ALLOYS WITH A LOW TITANIUM CONTENT (0 TO 1.5 PERCENT) BY WEIGHT
Michel Linard Jul. 1971 74 p refs Transl. into ENGLISH of CEA, Valduc, France, Report CEA-R-4180 Prepared for ORNL
(ORNL-tr-2579; CEA-R-4180) Avail: NTIS

The addition of small quantities of Ti improved the mechanical properties of uranium. This improvement was most significant when rapid cooling took place after the gamma phase was reached. A relation exists between the elastic and plastic properties: the rupture and yield strengths increased uniformly with the Ti content, while the maximum elongation occurred for Ti content between 0.4 and 0.6%. After quenching in water, alloys with Ti contents greater than 0.45% presented alpha prime sub a lamellar structures due to martensitic transformation from the gamma phase. After quenching in oil, an alpha prime sub s structure was produced by nucleation and growth just above the M sub s point. An extensive study of a 0.55% Ti alloy revealed the alloy to be relatively insensitive to quenching conditions a progressive recovery towards equilibrium conditions mechanical properties at high temperatures and an enhanced corrosion resistance compared to the uranium alloys with low Ti contents. NSA

N72-28550# California Univ., Berkeley. Lawrence Berkeley Lab.
CORRELATION OF THERMO-MECHANICALLY VARIED MICROSTRUCTURES WITH SUPERCONDUCTING PROPERTIES OF Nb3Sn PROCESSED BY A NEW POWDER METALLURGY TECHNIQUE M.S. Thesis
B. Naga Prakash Babu Dec. 1971 47 p refs
(Contract W-7405-eng-48)
(LBL-437) Avail: NTIS

A flexible, stable Nb3Sn composite was fabricated by a new powder metallurgy technique. Related studies and optimization of parameters in each step of the fabrication were made. The dependence of transition temperature on microstructural aspects was considered; an explanation was offered for the lowering of T sub c at higher reaction temperatures and the effect of reaction time is discussed. Short sample tests were made and current densities at dc fields up to 80 kG were measured; flexibility and stability were tested. An evaluation of all the process parameters was made and an optimum process schedule was developed. The T sub c for most samples ranged from 18.1 to 18.45 K. The current density in the Nb3Sn phase was around 2700 A/sq cm at 80 kG. Author (NSA)

N72-28551# British Steel Corp., London (England). Information Service.
OPEN REPORTS RELATED TO STRUCTURAL STEEL
Feb. 1972 48 p refs
(PB-208274; BISRA-INF/3/71) Avail: NTIS HC $3.00 CSCL 11F

This is a list of open reports and papers published by Bisra prior to December, 1971. Various aspects of corrosion and corrosion prevention and also the metallurgy and properties of structural steels are included. The list is divided into sections based on main subjects and cross referenced where relevant. Author (GRA)

N72-28552# Avco Lycoming Div., Stratford, Conn.
FEASIBILITY STUDY OF COLUMBIUM ALLOY CASTINGS Final Report

Richard J. Beauregard Nov. 1971 95 p
(Contract DAAG46-69-C-0163)
(AD-739572; AMMRC-CR-70-5(F)) Avail: NTIS CSCL 13/8

The objective of the program was to determine the feasibility of investment casting columbium alloys, namely, B-66 and C-3015. The REMET molding process, patented by REM Metals, Inc., Albany, Oregon, was used for the entire casting effort. Multiple test specimens were fused silicide coated and subjected to stress-rupture, tensile, ballistic impact, and environmental testing. At 2200 F, the rupture strength of the cast alloys is much greater than the wrought form. Tensile strength and ductility of the alloys were unacceptably low for engineering applications. Silicide coatings showed visible signs of distress after 120 hours of testing. Author (GRA)

N72-28553# Army Materials and Mechanics Research Center, Watertown, Mass.

POTENTIALS FOR POWDER METALLURGY PRODUCTS IN MILITARY APPLICATIONS

Lewis R. Aronin and Jacob Greenspan Mar. 1972 26 p refs
Presented at Tutorial Seminar 2 on Potentials for Power Met. in Mil. and Other Govt. Prod., Detroit, 8-9 Dec. 1971
(DA Proj. 1T0-61101-A-91-A)
(AD-739897; AMMRC-MS-72-2) Avail: NTIS CSCL 11/6

The potentials for the use of powder metallurgy by the Army are described in the paper in terms of: Recent developments in the technology of the powder metallurgy process, including powder production, consolidation and sintering, and attainment of high performance properties; Possible applications in Army Mission Areas; Specific illustrations of research and development activities in the Army aimed at utilizing the process for military applications. The paper concentrates primarily on the forging of low alloy steel preforms. Also it touches briefly on the status of titanium and superalloy powder metallurgy materials.
Author (GRA)

N72-28554# Westinghouse Electric Corp., Pittsburgh, Pa.

OPTIMIZATION OF STAINLESS STEELS FOR USE AS CONDENSER TUBES

N. Pessall and J. Nurmien Feb. 1972 100 p refs
(Contract DI-14-30-2708)
(PB-208059; OSW-RDPR-72-741) Avail: NTIS; SOD HC $1.00 as 2400-0704 CSCL 11F

Laboratory studies of ferritic stainless steels based on ternary alloys of Fe-Cr-Mo were made as a first step towards optimization of their composition, melting procedure, fabrication and heat treatment, for use as condenser tube material in desalination plants. The preparation and characterization of test coupons, representing eight compositions which exhibit a wide range of corrosion resistance, are described. Electrochemical methods were used to determine the relative corrosion resistance of the alloys and the data correlated with direct immersion tests in ferric chloride and synthetic seawater. Author (GRA)

N72-28555# British Steel Corp., London (England). Metallurgy Dept.

THE PRECISION OF DIRECT-READING EMISSION SPECTROMETRIC ANALYSIS

P. S. Bramhall, A. A. Greenfield, and P. H. Scholes Feb. 1972 10 p refs
(PB-208271; MC/CC/560/71) Avail: NTIS HC $3.00 CSCL 11F

The precision of direct-reading emission spectrometry for the analysis of low-alloy steel has been measured for one instrument. There is a strong relationship between precision and percentage content and a generalized statement based upon regression analysis is proposed for analytical performance. Confidence limits for analytical data have been calculated; these have important metallurgical significance in the formulation of closerange specifications, aim-points, and equations relating chemical composition to properties. Author (GRA)

N72-28556# British Steel Corp., London (England). Metallurgy Dept.

FACTORS INFLUENCING THRESHOLD STRESS, INTENSITY VALUES AND CRACK PROPAGATION RATES DURING STRESS CORROSION CRACKING TESTS OF HIGH STRENGTH STEELS

A. H. Priest Sep. 1971 14 p refs
(PB-207811; BISRA-MG/59/71) Avail: NTIS HC $3.00 CSCL 11F

A number of factors have been identified which influence both observed threshold stress intensity values and crack propagation rates for the stress corrosion of high strength steels in aqueous environments. More specifically: K (ISCC) value for a number of steels were shown to be related to the formation of a continuous stretch zone at the fatigue crack tip; both K (ISCC) and K (IC) values are influenced by the yield strength and inclusion density of the steel; the relative values of K (ISCC) determined by arrest and initiation methods and stress corrosion crack growth rates are influenced by the effectiveness of stress corrosion cracks as stress concentrators since integranular cracks become progressively blunting as they propagate while the reverse can be true of transgranular cracks; observed stress corrosion crack propagation rates are also influenced by the failure to attain equilibrium in specimens of conventional length and by the presence of crack curvature and crack branching where these occur. Author (GRA)

N72-28557# Rutgers Univ., New Brunswick, N.J. Materials Research Lab.

MICROSTRUCTURE AND FATIGUE PROPERTIES OF ALUMINUM BASE ALLOYS Technical Report, 1 Jul. 1969 - 31 Aug. 1971

Sigmund Weissmann Jan. 1972 15 p refs
(Contract F33615-70-C-1240; AF Proj. 7353)
(AD-739876; AFML-TR-71-277) Avail: NTIS CSCL 11/6

The microstructures of Al-3 wt. % Cu, Al 2024 and Al-6.5 at. % Zn alloys were studied as a function of aging temperature and time. The interaction of moving dislocations with precipitated particles and the generation of dislocations from particle-matrix interfaces were related to flow stress and fatigue life.
Author (GRA)

N72-28558# Army Materials and Mechanics Research Center, Watertown, Mass. Metals Div.

HARDNESS AND MICROSTRUCTURE OF PARTIALLY AUSTENITIZED 43XX STEEL

Weily F. Chiao and Eric B. Kula Dec. 1971 22 p refs
(DA Proj. 1T0-62105-A-328)
(AD-739906; AMMRC-TR-71-58) Avail: NTIS CSCL 11/6

A study was made of microstructures of several partially austenitized 43XX steels. By quenching from temperatures below those at which complete austenitization would occur, microstructures of martensite with ferrite and/or cementite were obtained. Microstructural analysis enabled the phase boundaries of the pertinent section of the phase diagram to be determined. Hardness changes in the as-quenched structures were correlated with the phase diagram. The major factor controlling the as-quenched hardness is the volume fraction and carbon content of the martensite in the structure. Author (GRA)

N72-28559# General Motors Technical Center, Warren, Mich. Materials and Structures Lab.

MEASUREMENT OF DYNAMIC PROPERTIES OF MATERIALS. VOLUME 4: ALPHA TITANIUM Final Report

Douglas R. Christman, Thomas E. Michaels, William M. Isbell, and Stephen G. Babcock Nov. 1971 132 p refs
(Contract DASA01-68-C-0114)
(AD-738862; MSL-70-23-Vol-4; DASA-2501-4-Vol-4) Avail: NTIS CSCL 11/6

Results of an experimental study on the dynamic properties of alpha titanium are presented. Areas studied included stress-strain-strain rate and reverse loading behavior, elastic constants, equation of state, compressive and release wave characteristics, and spall fracture. Author (GRA)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N72-28560 National Lending Library for Science and Technology, Boston Spa (England).
THE APPLICATION OF THE ATTENUATED TOTAL REFLECTANCE (ATR) METHOD IN THE INFRARED ANALYSIS OF MULTILAYER PAINT FILMS
K.-H. Reichert [1972] 24 p refs Transl. into ENGLISH from Farbe Lack (Hannover), no. 72, 1966 p 13-21 In English and GERMAN
(NLL-M-22253-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The application of the ATR method to paint specimens with a limited permeability for infrared is discussed. Multilayer film systems were examined, including lacquered polypropylene film. Analyses were conducted on paint films with built-up layers and the surface layers of film materials. K.P.D.

N72-28561 National Lending Library for Science and Technology, Boston Spa (England).
ELECTROPHORETIC APPLICATION OF PAINTS
K. H. Francen [1972] 41 p refs Transl. into ENGLISH from Farbe Lack (Hannover), v. 72, no. 1, 1966 p 36-50 In ENGLISH and GERMAN
(NLL-M-22248-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 4 NLL photocopy coupons

Results of research are reported on the effect of material, work piece, and pretreatment of paint deposition by electrokinetic techniques. Methods used for calculation of the requirements of electric power, cooling, etc. in electrocoating installations, and the operation of such plants on a technical scale, are presented. The relationship between deposition reactions and the results obtained is described, and certain pretreatment processes suitable for a variety of work pieces are considered. Practical examples are used to show how an electrophoretic dipping bath can be maintained at constant solid content, voltage, efficiency, and pH. It is emphasized that the stability of the paint is its single most important characteristic. Author

N72-28562 National Lending Library for Science and Technology, Boston Spa (England).
THE STRUCTURE OF LAYERS FORMED ON GLOW DISCHARGE NITRIDED IRON BASE MATERIALS
K. Keller 29 Feb. 1972 20 p refs Transl. into ENGLISH from Haerterei-Tech. Mill. (West Germany), no. 26, 1971 p 120-130 In ENGLISH and GERMAN
(NLL-Trans-746-1114-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The schematic diagram of an ion nitriding installation is presented. The principal interface reactions of the glow discharge with the piece surface are illustrated. These include dusting of the work piece, vapor plating of the material, and mass transfer equilibrium. The variation in the structure of the films formed is considered. K.P.D.

N72-28563 National Lending Library for Science and Technology, Boston Spa (England).
WHISKERS AND ULTRA-FINE THREADS
B. Bratt 20 Apr. 1972 11 p refs Transl. into ENGLISH from Tekn. Tidskr. (Copenhagen), no. 18, 1963 p 437-448
(NLL-102-(8660.5)) Avail: Natl. Lending Library, Boston Spa, Eng.: 2 NLL photocopy coupons

When the resistance of a material is calculated on the basis of atomic bonding forces, excessively high values are obtained. This is due to the fact that the crystal lattice contains defects which take the form of cracking and reduce the strength of the material. Measurements on some characteristic crystal formations, whiskers, show however, that such formations are free from defects and their resistance is consequently close to the theoretical value. Author

N72-28564*# North American Rockwell Corp., Downey, Calif. Space Div.
STUDY OF THE PRODUCTION OF UNIQUE NEW GLASSES Final Report
Ralph A. Happe 13 Jun. 1972 153 p refs
(Contract NAS8-28014)
(NASA-CR-123740; SD-72-SA-0083) Avail: NTIS HC $9.75 CSCL 11D

A number of high new oxide glasses have been prepared by a laser-spin melting technique where droplets are ejected from a molten mass. Techniques have been developed for measuring the optical properties of most of the new glasses so produced. A preliminary study of processing equipment for producing new glasses in a zero gravity environment onboard manned space laboratory is reported. Induction and laser melting emerge as preferred techniques for melting spheroids of new glass compositions in space. Sample calculations for power required to induction melt new glass compositions are presented. Cooling rate calculations show that radiation cooling of the high melting materials results in very short cooling times for 1/2 inch diameters to temperatures where the spheroids can be handled. Author

N72-28565*# Syracuse Univ. Research Corp., N.Y. Materials Science Lab.
ULTRA HIGH VACUUM ADHESION TESTING OF NERVA ENGINE MATERIALS Final Report, 1 Apr. - 30 Nov. 1969
Apr. 1970 42 p refs Sponsored in part by NASA and AEC Prepared for Union Carbide Corp., Oak Ridge, Tenn.
(Contract UC-3245)
(NASA-CR-127457; TID-25727) Avail: NTIS HC $4.25 CSCL 11D

The primary objective of this research program was to determine the effects of surface cleaning and deliberate gaseous contamination on the adhesion behavior of selected candidate materials for use in the NERVA nuclear rocket engine program. Using a torsion balance technique, the relationship between the normal compressive load applied to crossed rod samples and the resultant contact resistance was used to ascertain the extent of adhesion under each set of experimental conditions. In addition to an evaluation of the static adhesion behavior of selected materials combinations, the experimental apparatus was modified to permit a similar investigation relating to the effects of specific tangential displacements of the sample wires, i.e., their sliding friction behavior. During the course of this subcontract, the materials combinations 440 C vs. 440 C. pyrographite vs ZTA graphite, Nbc (graphite) vs. Nbc (graphite), and Electrolize Inconel 718 vs. Au electroplated 302 S/S were evaluated. Author

N72-28566*# General Electric Co., Houston, Tex.
SYSTEMATIC CONTROL OF NONMETALLIC MATERIALS FOR IMPROVED FIRE SAFETY
Washington NASA 1972 38 p refs Sponsored by NASA
(NASA-SP-5109) Avail: NTIS; SOD $0.45 as 3300-0442 CSCL 11D

The elements of a systematic fire safety program are summarized and consist of fire safety criteria, design considerations, testing of materials, development of nonmetallic materials, nonmetallic materials information systems, design reviews, and change control. The system described in this report was developed for the Apollo spacecraft. The system can, however, be tailored to many industrial, commercial, and military activities. Author

N72-28567*# Techtran Corp., Glen Burnie, Md.
PROJECT HELIOS INVESTIGATION OF ADHESIVES WITH RESPECT TO HEAT RESISTANCE AND WEIGHT
J. Schneider, D. Scheel, and H. W. Boller Washington NASA Mar. 1972 24 p Transl. into ENGLISH of West German rept. BMBW-FB-W-71-16 dated Apr. 1971 35 p
(Contract NASw-2037)
(NASA-TT-F-14158; BMBW-FB-W-71-16) Avail: NTIS HC $3.25 CSCL 11A

Solar battery components were cemented with a series of curable adhesives and tested under severe time and temperature conditions approximating those that would be encountered by such components in space. Those components were tested after cementing both by peeling and by tension vertical to the flat surface. The product XR 63-489 proved to be the preferred adhesive for reasons of strength, processability, and elasticity.
Author

N72-28568*# Little (Arthur D.), Inc., Cambridge, Mass.
DEVELOPMENT OF A FLAMEPROOF ELASTIC ELASTOMERIC FIBER Final Report, 1 Jan. 1970 - 1 Jan. 1971
J. T. Howarth, J. Nilgrom, A. Massucco, S. G. Sheth, and F. Dawn Mar. 1971 87 p
(Contract NAS9-10424)
(NASA-CR-115227; ADL-72210) Avail: NTIS HC $6.50 CSCL 11E

Various flexible polyurethane structures containing halogen were synthesized from polyesters derived from aliphatic or aromatic polyols and dibasic acids. Aliphatic halide structures could not be used because they are unstable at the required reaction temperatures, giving of hydrogen halide which hydrolyzes the ester linkages. In contract, halogen-containing aromatic polyols were stable and satisfactory products were made. The most promising composition, a brominated neopentyl glycol capped with toluene disocyanate, was used as a conventional diisocyanate, in conjunction with hydroxy-terminated polyethers or polyesters to form elastomeric urethanes containing about 10% bromine with weight. Products made in this manner will not burn in air, have an oxygen index value of about 25, and have tensile strength values of about 5,000 psi at 450% elongation. The most efficient additives for imparting flame retardancy to Spandex urethanes are aromatic halides and the most effective of these are the bromide compounds. Various levels of flame retardancy have been achieved depending on the levels of additives used.
Author

N72-28569*# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
EROSION OF GRAPHITE SURFACE EXPOSED TO HOT SUPERSONIC HYDROGEN GAS
Om P. Sharma 27 Jun. 1972 36 p refs Backup document for AIAA Synoptic, "Erosion of Graphite Surface Exposed to High Temperature Supersonic Hydrogen Gas", scheduled for publication in Journal of Spacecraft and Rockets in Nov. 1972
(Grant NGR-31-001-230)
(NASA-CR-127636) Avail: NTIS HC $4.00 CSCL 11D

A theoretical model based on laminar boundary layer flow equations was developed to predict the erosion rate of a graphite (AGCarb-101) surface exposed to a hot supersonic stream of hydrogen gas. The supersonic flow in the nozzle outside the boundary layer formed over the surface of the specimen was determined by assuming one-dimensional isentropic conditions. An overall surface reaction rate expression based on experimental studies was used to describe the interaction of hydrogen with graphite. A satisfactory agreement was found between the results of the computation, and the available experimental data. Some shortcomings of the model and further possible improvements are discussed.
Author

N72-28570*# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
A LAYERED COMPOSITE WITH A BROKEN LAMINATE
G. D. Gupta Jun. 1972 28 p refs
(Grants NGR-39-007-011 ; NSF GK-11977)
(NASA-CR-127686; IFSM-72-19; TR-72-3) Avail: NTIS HC $3.50 CSCL 11D

The problem of a laminate composite in the presence of a crack located normal to the bond lines is considered. Stress analysis of the limiting case when the crack extends to the bond lines is carried out. An integral transform technique is used to formulate the problem in terms of a singular integral equation. The power of stress singularity around the crack tip terminating at the interface is obtained using the above technique. The singular integral equation is solved numerically and the effect of material properties on the stress intensity factor is calculated.
Author

N72-28571*# Lehigh Univ., Bethlehem, Pa.
FRACTURE PROBLEMS IN COMPOSITE MATERIALS
F. Erdogan Apr. 1972 60 p refs
(Grants NGR-39-007-011; NSF GK-11977)
(NASA-CR-127700; NASA-TR-72-2) Avail: NTIS HC $5.00 CSCL 11D

A series of fracture problems in composite materials are identified, their methods of solution are briefly discussed, and some sample results are presented. The main problem of interest is the determination of the stress state in the neighborhood of localized imperfections such as cracks and inclusions which may exist in the composite. Particular emphasis is placed on the evaluation of quantities such as the stress intensity factors, the power of the stress singularity, and the strain energy release rate, which may be used directly or indirectly in connection with an appropriate fracture criterion for the prediction of fracture initiation and propagation load levels. The topics discussed include a crack in layered composites, a crack terminating at and going through a bi-material interface, a penny-shaped crack in a filament-reinforced elastic matrix, and inclusion problems in bonded materials.
Author

N72-28572*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACHIEVEMENT OF A LOW-OUTGASSING WHITE PAINT SYSTEM FOR SPACECRAFT THERMAL CONTROL
Benjamin Seidenberg, John J. Park, and Carroll Clatterbuck Washington Aug. 1972 18 p refs
(NASA-TN-D-6892; G-1067) Avail: NTIS HC $3.00 CSCL 11C

Test results and data for achieving a low-outgassing polymer resin suitable for potting or a paint pigment are presented. The resin, prepared in 0.5-kg (1-lb) batches, is acceptable for spacecraft use; its weight loss is less than 0.5 percent, and the volatile condensable materials are less than 0.05 percent. The paint adheres to a primed fiber glass or aluminum substrate. Results of UV irradiation, electron and proton radiation, and thermal cycling are presented.
Author

N72-28573*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
GAS SURFACE INTERACTIONS OCCURRING ON MATERIALS WITHIN ULTRAHIGH VACUUM Ph.D. Thesis - va. Polytechnic Inst.
Ronald Allen Outlaw May 1972 127 p refs
(NASA-TM-X-68689) Avail: NTIS HC $8.50 CSCL 11D

The physical adsorption of nitrogen on the chemically cleaned surfaces of Pyrex, 347 stainless steel and polycrystalline nickel was investigated over the pressure range 1 x 10 to the minus 12th power to 3 x 10 to the minus 7th power torr and for temperatures 77.4 and 87.4 K. The adsorption data were linearized by the Dubinin-Radushkevich equation. The metal surfaces were cleaned by electron impact desorption (EID) and the desorbed gases analyzed by mass spectrometry. Work function measurements were also used to indicate changes in the surface condition following an EID dose. At least a monolayer of gas was observed to desorb from the metal surfaces. The isotherms revealed that the metal surfaces were very heterogeneous and that the Pyrex surface had been

leached. The calculated isosteric heats of adsorption indicated that the relative order of the physical binding of nitrogen to the solids was 347 stainless steel > Pyrex > nickel. A relationship was observed to exist in the dynamic technique between the equilibration time and the pressure above the absorbed layer. The slope of the log-log plot of these parameters was found to be sensitive to the surface heterogeneity and may be related to the activation energy for surface diffusion of physically absorbed molecules. Author

N72-28574*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL INVESTIGATION OF THE MECHANICAL BEHAVIOR OF A FILLED ELASTOMER AT PRESSURES BELOW 10 TO THE -6TH POWER TORR Ph.D. Thesis - Va. Polytechnic Inst.
Gerald Lee Gregory May 1972 214 p refs
(NASA-TM-X-68688) Avail: NTIS HC $12.75 CSCL 11D

The mechanical behavior of a filled elastomer was studied with emphasis on understanding the vacuum-material interactions occurring, and to develop analytical techniques for predicting the vacuum behavior. The test results indicate that two separate mechanisms are involved in the observed property changes: the first controls the time response to applied stress; the second determines the initial internal state of the materials as the result of stresses. It is concluded that the mechanical property changes are attributable to changes in the relaxation processes occurring in the material. These changes are brought about by outgassing of water. Recommendations for future investigations are included. F.O.S.

N72-28575# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
A STUDY OF INTERFACIAL REACTIONS IN TITANIUM/SAPPHIRE (Al_2O_3) COMPOSITES
Gary Geschwind Jul. 1972 44 p refs
(RM-549) Avail: NTIS HC $4.25

The reactions between sapphire filaments and Ti70A and Ti75A matrices were studied over the temperature range 600 to 1000 C for various times. The filament decomposed through diffusion of both aluminum and oxygen into the Ti matrix. Two rate constants were measured for the reaction zone growth; an activation energy of 23 Kcal/mole was calculated above 800 C and a value of 53 Kcal/mole below. It was determined from microhardness measurements in the matrix that oxygen diffusion was primarily occurring with a temperature dependence of $D = 0.28 \exp - (40230/RT)$ sq cm/sec. Unless the embrittling effects of the reaction can be controlled, it appears that Ti/Al_2O_3 composites will not be a viable system as compared to Ti/B or Ti/SiC composites. Author

N72-28576# Princeton Univ., N.J. Frick Chemical Lab.
PROPERTIES OF DEXSIL 300 RUBBERS
Robert M. Mininni and Arthur V. Tobolsky Mar. 1972 23 p refs
(Contract N00014-67-A-0151-0011; NR Proj. 056-377)
(AD-739723) Avail: NTIS CSCL 11/10

The physical and elastomeric properties of several DEXSIL 300 (10-SiB-3) samples were investigated. Modulus-temperature studies were used to determine the glass transition temperature, the melting temperature, and the oxidative crosslinking temperature. Stress relaxation in air at elevated temperatures was used to compare the oxidative stability of the various formulations. Author (GRA)

N72-28577# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
INTERACTIVE PROGRAM FOR ANALYSIS AND DESIGN PROBLEMS IN ADVANCED COMPOSITES TECHNOLOGY Final Report, Nov. 1969 - Oct. 1971
T. A. Cruse and J. L. Swedlow Dec. 1971 300 p refs
(Contract F33615-70-C-1146)
(AD-739560; AFML-TR-71-268) Avail: NTIS CSCL 11/4

During the past year an experimental program in the fracture of advanced fiber composites has been completed. The experimental program has given direction to additional experimental and theoretical work. A synthesis program for designing low weight multifastener joints in composites is proposed, based on extensive analytical background. A number of failed joints have been thoroughly analyzed to evaluate the failure hypothesis used in the synthesis procedure. Finally, the report includes new solution methods for isotropic and anisotropic (mid-plane symmetric) laminates using the boundary-integral method. The solution method offers significant savings of computer core and time for important problems. Author (GRA)

N72-28578# Drexel Univ., Philadelphia, Pa. Dept. of Metallurgical Engineering.
ROLE OF THE INTERFACE ON ELASTIC/PLASTIC COMPOSITE BEHAVIOR
A. Lawley and M. J. Koczak Mar. 1972 58 p refs
(Contract N00014-67-A-0406-0001; NR Proj. 031-721)
(AD-739756; TR-7) Avail: NTIS CSCL 11/4

The key to an understanding of the elastic and plastic behavior of composite materials is a characterization of the nature and role of the interface or interfacial region between phases. The current status of analytic and experimental studies is reviewed in relation to filamentary composites and those produced by directional solidification. Attention is directed to interface structure and bond integrity, efficiency of load transfer, interface stability, and the effect of mode of loading. Author (GRA)

N72-28579# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
A NEW MODEL FOR THE DYNAMIC BEHAVIOR OF ELASTOMERIC MATERIALS Technical Report, Jun. 1970 - Sep. 1971
J. L. Edwards and D. R. Hicks Dec. 1971 47 p refs
(AF Proj. 7351)
(AD-739857; AFML-TR-71-272) Avail: NTIS CSCL 11/10

A mathematical model describing the dynamic behavior of rubber or elastomeric materials was developed. It is based on Flory's concept of the rotational isomeric state model of polymer chains. With a unit step strain applied to the material, each polymer chain is assumed to go from an unrelaxed initial configuration to a fully relaxed equilibrium state at a rate described by a non-linear first-order differential equation. The differential equation is derived by assuming that the relaxation rate is proportional to a probability function, namely, the probability that the elastic and thermal energy present in the chain is greater than or equal to a critical value. Author (GRA)

N72-28580# Systems Research Labs., Inc., Dayton, Ohio.
INVESTIGATION OF THE BEHAVIOR OF HIGH TEMPERATURE MATERIALS Final Report, Jul. 1968 - Jul. 1971
Walter C. Tripp, Edward T. Rodine, and John E. Stroud Wright-Patterson AFB, Ohio ARL Oct. 1971 244 p refs
(Contract F33615-69-C-1017; AF Proj. 7021)
(AD-739862; ARL-71-0235) Avail: NTIS CSCL 11/2

The report summarizes investigations of selected materials in three principal areas: Defect structure of metal oxides at high temperatures; Thermoluminescence of doped and undoped ThO_2 and; Oxidation of high-temperature materials. Extensive defect structure investigations, including weight and conductivity measurements, were performed on NiO and Sc_2O_3 and the results are presented with a discussion of relevant defect models. Detailed conductivity measurements on CoO were also made. In addition, conductivity data for 76% CeO_2 - 20% ZrO_2 4% Y_2O_3 are presented. The UV excited thermoluminescence of over 40 single crystals of undoped and rare earth doped ThO_2 was measured. Presented here is a summary of the major conclusions of this investigation. The oxidation program concentrated on two materials - ZrB_2 and ZrB_2-20 v/o SiC.

Data is also presented on the effect of surface preparation methods on the oxidation of Ti-6A1-4V at 700 C. In addition, oxidation data on several Ni-Cr-Y alloys (1000-1200 C) is included. Author (GRA)

N72-28581# Aerospace Corp., El Segundo, Calif.
STRESS WAVE ATTENUATION IN COMPOSITE MATERIALS Technical Report, Jun. - Nov. 1971
Charles Sve 17 Apr. 1972 17 p refs
(Contract F04701-71-C-0172)
(AD-739929; TR-0172(2240-30)-4; SAMSO-TR-72-65) Avail: NTIS CSCL 11/4

An analysis is presented for one-dimensional wave propagation in composite materials. The effects of geometric dispersion and spatial attenuation are included through the introduction of a complex wave number. This type of problem arises when the constituents of the composite are viscoelastic or when heat is generated due to thermoelastic coupling or scattering from inclusions occurs. The analysis is restricted to the low-frequency portion of the response and is therefore valid only in the far field. Author (GRA)

N72-28582# Picatinny Arsenal, Dover, N.J.
ACTIVATED GAS PLASMA SURFACE TREATMENT OF POLYMERS FOR ADHESIVE BONDING, PART 3
Carolyn A. L. Westerdahl, J. Richard Hall, David W. Levi, and M. J. Bodnar Feb. 1972 46 p refs
(AD-738530; PA-TR-4279-Pt-3) Avail: NTIS CSCL 11/9

During the past year the authors have continued their survey of the effects of low temperature plasma or activated gases on polymers and have extended it to some rubbers. The variation of bond strengths with the time of exposure to excited gases was investigated for the following polymers: nylon 6, nylon 66, polystyrene, cellophane, high-density polyethylene, poly(vinylidene fluoride) (Kynar), poly(oxymethylene)homopolymer (Delrin), poly(oxymethylene)copolymer, low-density polyethylene, and poly(vinyl fluoride) (Tedlar). The last five polymers were investigated in some detail and the results are reported here. Author (GRA)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N72-28583 National Lending Library for Science and Technology, Boston Spa (England).
HARMONIC POLYNOMIALS ORTHOGONAL ON A PLANE CURVE
A. A. Cygankov [1972] 8 p refs Transl. into ENGLISH from Dokl. Acad. Nauk SSSR (Moscow), no. 197, 1971 p 794-797 No diagrams, etc.; to be used in conjunction with original book
(NLL-M-22324-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A closed rectifiable Jordan curve defined parametrically as x = x(s), y = y(s), where s is the arc length is considered. A system of harmonic polynomials orthogonal on the curve with a weight n(s) is obtained. Properties of the polynomials are outlined, and theorems on functions belonging to the system are proved. N.E.N.

N72-28584 National Lending Library for Science and Technology, Boston Spa (England).
ON WAYS OF FINDING FUNCTIONS DEVIATING LEAST FROM FUNCTIONS OF MANY VARIABLES
I. I. Ibragimov and M. B. A. Babaev [1972] 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk (Moscow), v. 1971, 1971 p 766-769 No diagrams etc. to be used in conjuction with original book
(NLL-M-22322-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

An effective method is discussed for finding the function which best approximates a given function in a certain class. Two means of construction are presented: the first in which the given function is a generalized polynomial, in which U and V are continuously monotonic functions, and the second in which the function is arbitrary and continuous in the class. K.P.D.

N72-28585 Tata Inst. of Fundamental Research, Bombay (India).
LECTURES ON GALOIS COHOMOLOGY OF CLASSICAL GROUPS
Martin Kneser 1969 167 p refs
Copyright. Avail: Issuing Activity $2.00

The contents of lectures given at the Tata Institute in Bombay in January and February 1967 are presented. The Hasse principle is discussed for the one-dimensional Galois cohomology of simply-connected classical groups over number fields. For most groups, this result is closely related to other types of Hasse principle. Some of these are well known, in particular those for quadratic forms. Two less well known cases are:(1) Hermitian forms over a division algebra with an involution of the second kind; the result is connected with (but not equivalent to) a theorem of Landherr, and skew Hermitian forms over a quaternion division algebra. A proof by T. Springer is reproduced as an appendix. Author

N72-28586# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany).
[NUMERICAL ANALYSIS OF COMET MODELS] [NUMERISCHE BEHANDLUNG EINES KOMETENMODELLS]
B. Brosowski (Goettingen Univ.) and R. Wegmann Apr. 1972 20 p refs In GERMAN
(MPI/PAE-Astro-46) Avail: NTIS HC $3.00

An iterative solution for the interaction between a comet and the interplanetary plasma is presented. Assumed is a stationary contact surface for calculating the three dimensional rotation symmetrical flow field using hydrodynamic equations. Transl. by G.G.

N72-28587# Toulouse Univ. (France).
CONTRIBUTION TO THE STUDY OF HIERARCHICAL COMMAND STRUCTURES WITH A VIEW TO THE OPTIMIZATION OF COMPLEX PROCESSES Ph.D. Thesis [CONTRIBUTION A L'ETUDE DES STRUCTURES DE COMMANDE HIERARCHISEES EN VUEDE L'OPTIMISATION DES PROCESSES COMPLEXES]
Andre Titli 19 Jun. 1972 305 p refs In FRENCH
Avail: NTIS HC $17.25

General principles of hierarchical command, including the notion of levels and the choice of structure, are considered. Optimal static command on two levels is discussed for systems with and without constraint inequality. The extension to nonseparable problems is presented. Optimal dynamic command systems at two levels are reviewed and applications are also presented. Transl. by K.P.D.

N72-28588# Brown Univ., Providence, R.I. Div. of Applied Mathematics.
NONLINEAR FILTERING: DERVIATION OF THE DYNAMICAL EQUATION FOR CONDITIONAL EXPECTATION
Harold J. Kushner 20 Mar. 1972 26 p refs
(Contract AF-AFOSR-2078-71; AF Proj. 9749)
(AD-739970; AFOSR-72-0718TR) Avail: NTIS CSCL 12/1

A nonlinear filtering problem is considered where the signal is g(x(t)), where t(x) is the Ito solution of the differential equation and the observations y(s), s < or = t, are available at time t and w(r) is a Wiener process. Dynamic equations are derived for conditional expectations for suitable functions h. Two derivations

are given. The weakest conditions are used for the second theorem. Author (GRA)

N72-28589*# College of William and Mary, Williamsburg, Va. Dept. of Mathematics.
A SHORT PROOF OF MACLANE'S PLANARITY THEOREM
P. V. ONeil [1970] 4 p refs
(Grant NGL-47-006-055)
(NASA-CR-127463) Avail: NTIS HC $3.00 CSCL 12A

This note gives a short and elementary proof of MacLane's theorem on the embedding of graphs in a 2-sphere. Author

N72-28590# Technische Hochschule Hannover (West Germany). Fakultaet fuer Mathematik und Naturwissenschaften.
THE TRANSFORMATION PROBABILITIES OF LIMITED POISSON WAITING PROCESSES WITH STATE DEPENDENT PARAMETERS AND PREEMPTIVE REPEAT PRIORITIES Ph.D. Thesis [DIE UEBERGANGSWAHRSCHEINLICHKEITEN BESCHRAENKTER POISSONSCHER WARTEPROZESSE MIT ZUSTANDSABHAENGIGEN PARAMETERN UND PREEMPTIVE-REPEAT-PRIORITAEN]
Dieter Lohse 1971 124 p refs In GERMAN
Avail: NTIS HC $8.25

Limited Poisson queueing processes with dependent parameters and k equal to or greater than one are studied. The processes are defined by priorities and some of their basic properties are described. A matrix polynomial is outlined that can be easily calculated by computer for even a 100-row matrix and that is only limited for large t-values by machine noise.
Transl. by G.G.

N72-28591# Electrotechnical Lab., Tokyo (Japan).
NUMERICAL METHODS FOR THE ABEL INVERSION
Akira Yaoita Nov. 1971 55 p refs In JAPANESE; ENGLISH summary
(Circ-172) Avail: NTIS HC $4.75

It is of interest to determine the internal conditions of a medium to be measured based on the results of observation made from the outside of the medium. The mathematical treatment is possible in a medium with a spatial distribution of cylindrical symmetry. In particular a problem of obtaining the distribution of the emission coefficient from the measured radiance profile of an emitting optical thin medium amounts to solving Abel's integral equation. This analysis is called Abel inversion. Numerical solutions and numerical methods of formal solutions for the Abel inversion are reviewed. Abel's integral equation which is the starting point of calculations, and its formal solution which is the criterion for the comparison with the numerical method are given. Methods by which the internal diagnosis is numerically performed using the cylindrical division of the profile of the medium are shown. Diagnostic methods using the formal solution and the data approximated by polynomials are also presented. Author

N72-28592# Laboratoire d'Automatique et de Ses Applications Spatiales, Toulouse (France).
DETERMINATION OF A MINIMUM OR QUASI-MINIMUM SET OF KNOTS ENABLING THE INTERRUPTION OF ALL THE CIRCUITS IN A DIRECTED GRAPH [DETERMINATION D'UN ENSEMBLE MINIMAL OUQUASI MINIMAL DE SOMMETS PERMETTANT DE COUPER TOUS LES CIRCUITS D'UN GRAPHE ORIENTE]
M. Diaz, J. P. Richard, and M. Courvoisier Mar. 1972 24 p refs In FRENCH
(LAAS-SL-72-I-06) Avail: NTIS HC $3.25

The problem of determining the minimum set of knots in an oriented graph, making it possible to interrupt all circuits, is considered. A preliminary reduction is performed which limits the number of knots to be considered, and main circuits are defined which lead to a decision table. A suitable algorithm, which gives a near optimal solution using only the graph, is described. ESRO

N72-28593# Washington Univ., Seattle. Dept. of Mathematics.
UNIONS OF INCREASING AND INTERSECTIONS OF DECREASING SEQUENCES OF CONVEX SETS
Victor R. Klee (Colorado Univ., Boulder) Jan. 1972 16 p refs
(Contract N00014-67-A-0103-0003)
(AD-739710; TR-30) Avail: NTIS CSCL 12/1

For a convex set X in a real vector space, let C(X) denote the class of all convex subsets of X, U(X) the class of all unions of strictly increasing sequences in C(X), and I(X) the class of all intersections of strictly decreasing sequences in C(X). Let U prime (X) = C(X) about U(X) and I prime (X) = C(X) about = I(X). The subclasses = U(X) and I(X) are described (or, equivalently, U prime (X) and I prime (X)) in geometric terms, especially when X is a finite dimensional flat. Author (GRA)

N72-28594# Texas Univ., Austin. Center for Numerical Analysis.
PROJECTIONS WITH FINITE CARRIER
E. W. Cheney Jul. 1971 21 p refs Presented at the Conf. on Numerical Methods of Approximation Theory, Oberwolfach, Germany, 14-18 Jun. 1971
(Grant AF-AFOSR-2130-71; AF Proj. 9749)
(AD-739892; CNA-28; AFOSR-72-0797TR) Avail: NTIS CSCL 12/1

The paper discusses the fundamental problem with the most favorable approximation properties. Author (GRA)

N72-28595# Texas Univ., Austin. Center for Numerical Analysis.
ON THE EXISTENCE AND CHARACTERIZATION OF MINIMAL PROJECTIONS
P. D. Morris and E. W. Cheney Jan. 1972 35 p refs
(Grant AF-AFOSR-2130-71; AF Proj. 9749)
(AD-739893; CNA-37; AFOSR-72-0798TR) Avail: NTIS CSCL 12/1

The paper is devoted to the characterization problem of minimal projections. Author (GRA)

N72-28596# Naval Underwater Systems Center, Newport, R.I.
EXACT SOLUTION OF THE NONLINEAR DIFFERENTIAL EQUATION R(2ND DERIVATIVE OF R/dt) PLUS 3/2 (dR/R/dt MINUS A/R TO THE MINUS 4TH POWER) PLUS B EQUALS 0
Donald R. Childs 14 Feb. 1972 12 p refs
(AD-740106; NUSC-TM-RA321-4010-72) Avail: NTIS CSCL 12/1

The nonlinear equation R(2nd derivative R with respect to t) plus (3/2)(dR/dt) squared-A/(R sup4) plus B equals 0 is shown to represent simply periodic motion with a minimum at R sub 1 and a maximum at (R sub 1)(R sub 0) or a maximum at R sub 1 and a minimum at (R sub 1)/(R sub 0). R sub 0 is a function of the ratio A/B and is greater than 1 for A/B=1 and less than 1 for A/B-1. The period of the motion satisfies the simple relation T(1/R sub 0) equals (1/R sub 0)(T(R sub 0)). The exact solution to the above equation is represented in terms of elliptic integrals of the first and second kinds and a simple algebraic function.
Author (GRA)

N72-28597# Stanford Univ., Calif. Dept. of Operations Research.
THEORY OF CONTINUOUS STORAGE WITH MARKOV ADDITIVE INPUTS AND A GENERAL RELEASE RULE
Erhan Cinlar Mar. 1972 49 p refs
(Contracts N00014-67-A-0112-0031; F44620-67-C-0049; Grant NSF GP-2023)
(AD-740107; SU-TR-18) Avail: NTIS CSCL 12/2

A continuous storage model is introduced where the release rate is given by an arbitrary continuous increasing function r and the input process Y has conditionally independent (in general non-stationary) increments given the paths of a Markov process X. Then the content process Z is defined by a stochastic integral equation. Its solution is obtained and shown to be a conditional

Markov process defined on the Markov process X, and the two-dimensional process (X,Z) is almost a standard Markov process. Ergodic properties of Z are discussed in terms of the paramerers defining the input Y and necessary and sufficient conditions are given for the existence of proper limiting distributions in a special case of particular interest.

Author (GRA)

N72-28598# Yale Univ., New Haven, Conn. Becton Center.
AN IDENTIFICATION PROCEDURE FOR LINEAR MULTI-VARIABLE SYSTEMS
Prabhakar Kudva and Kumpati S. Narendra Apr. 1972 17 p refs
(Contract N00014-67-A-0097-0020; NR Proj. 375-131)
(AD-740109; CT-48) Avail: NTIS CSCL 12/1

In the report, the direct method of Lyapunov is employed to outline a procedure for the continuous identification of a multivariable dynamical system from measurements on the inputs and the state variables of the system. The procedure results in the convergence of every parameter of a model to the corresponding one of the system as time t approaches infinity. The overall process is also shown to be asymptotically stable. Computer simulation results are included to illustrate the effectiveness of the suggested scheme. Author (GRA)

N72-28599# Iowa Univ., Iowa City. Dept. of Mathematics.
ON STRONGLY CONNECTED AUTOMATA
Robert H. Oehmke Mar. 1972 14 p refs
(Contract N00014-68-A-0500)
(AD-740089; TR-53) Avail: NTIS CSCL 12/1

A characterization of semigroups having strongly connected automata is presented in terms of the admissibility of certain types of homomorphic images. Author (GRA)

N72-28600# Aerospace Research Labs., Wright-Patterson AFB, Ohio. Applied Mathematics Research Lab.
A POSTERIORI FORWARD ERROR ANALYSIS Interim Report
Nai-Kuan Tsao Dec. 1971 27 p refs
(AF Proj. 7071)
(AD-739890; ARL-71-0287) Avail: NTIS CSCL 12/1

The general principle of a posteriori forward error analysis is discussed. The fundamental idea is simply based on the fact that the difference between the computed result of any of the basic floating-point operations and the exact result can be estimated using the computed result. For algorithms with finite number of arithmetic operations, this idea can be extended easily so that forward error analysis is possible. Some results of certain useful algorithms are derived using this approach. Author (GRA)

N72-28601# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
ERROR ANALYSIS OF GAUSSIAN ELIMINATION METHOD FOR SOLVING SYSTEM OF LINEAR ALGEBRAIC EQUATIONS Interim Report
Nai-Kuan Tsao Dec. 1971 32 p refs
(AF Proj. 7071)
(AD-739891; ARL-71-0288) Avail: NTIS CSCL 12/1

A posteriori forward error analysis was applied to the Gaussian elimination method for solving system of linear algebraic equations of the type Az = p. By attributing the generated round-off errors properly to the matrices A and p, it is shown that the computed z satisfies a new perturbed system such that (A + delta A)z = p + delta p. For large system order n, the upper bounds for delta A and delta p in infininte norm are shown to be proportional to n squared, instead of n cubed obtained by the usual backward error analysis where round-off errors are attributed totally to the system matrix A.

Author (GRA)

N72-28602# Wisconsin Univ., Madison. Dept. of Statistics.
LEAST SQUARES ESTIMATION FOR A CLASS OF NON-LINEAR MODELS
Irwin Guttman, Victor Pereyra, and Hugo D. Scolnik Sep. 1971 21 p refs
(Grant AF-AFOSR-1803-69; AF Proj. 9749)
(AD-739966; AFOSR-72-0719TR; TR-279) Avail: NTIS CSCL 12/1

A new method for determining least squares estimators for certain classes of non-linear models is discussed. The method is an extension of a variable projection method of Scolnik (1970), and involves the minimization of a modified functional. The feature of minimizing this modified functional is that for a certain class of non-linear models, called the constant coefficients case, only one half the parameters are involved initially. To find the estimators of the remaining parameters is straight forward and relatively easy. This new two-step procedure is shown to be equivalent to the over-all least squares procedure. The authors also discuss the case of a class of models called the variable coefficients class. For this case, the authors formulate a new algorithm for determining the estimators which make use of approximate confidence regions for the parameters.

Author (GRA)

N72-28603# Washington Univ., Seattle. Dept. of Mathematics.
RESEARCH IN CONVEX ANALYSIS WITH APPLICATIONS TO AEROSPACE LOGISTICS Final Scientific Report, 1 Jan. 1970 - 31 Jan. 1971
R. Tyrrell Rockafellar 3 Mar. 1972 6 p refs
(Grant AF-AFOSR-1994-71; AF Proj. 9749)
(AD-739968; AFOSR-72-0720TR) Avail: NTIS CSCL 12/1

Seven papers were produced on the subject of applications of the theory of convex functions to optimization problems of various sorts, especially those involving integral functionals.

Author (GRA)

N72-28604# University of Southern Calif., Los Angeles. Dept. of Aerospace Engineering.
BUILDING AND EVALUATING NON-LINEAR FILTERS
Richard S. Bucy 24 Mar. 1972 24 p refs
(Grant AF-AFOSR-2141-71; AF Proj. 9749)
(AD-739990; AFOSR-72-0758TR) Avail: NTIS CSCL 12/1

A survey is given of efforts to realize optimal non-linear filters by using digital computers. In particular, the passive receiver and the phase demodulation problem are discussed and Monte Carlo results are presented. Author (GRA)

N72-28605# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A TWO-LEVEL DIFFERENCE SCHEME FOR SYSTEMS OF NON-LINEAR SECOND ORDER HYPERBOLIC DIFFERENTIAL EQUATIONS
Aivars K. R. Celmis Feb. 1972 53 p refs
(DA Proj. 1T0-61102-A-14-B)
(AD-739918; BRL-MR-1569) Avail: NTIS CSCL 12/1

The report describes and analyzes a difference scheme for the numerical solution of systems of non-linear second order totally hyperbolic differential equations. A special feature of the scheme is the variable time step which generally results in savings of computing time. The scheme is of fourth order and it satisfies von Neumann stability conditions. Formulas are derived for the estimation of the errors of the results. Author (GRA)

N72-28606# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
PERCENTAGE POINTS OF THE JOINT DISTRIBUTION OF THE EXTREME ROOTS OF THE RANDOM MATRIX S SUB 1(S SUB 1 PLUS S SUB 2) TO THE MINUS 1ST POWER Final Report
F. J. Schuurmann (Miami Univ., Oxford, Ohio), V. B. Waikar (Miami Univ., Oxford, Ohio), and P. R. Krishnaiah Nov. 1971 33 p refs

(AF Proj. 7071)
(AD-739940; ARL-71-0259) Avail: NTIS CSCL 12/1

Let S(1) and S(2) be independently distributed as central Wishart matrices with n(1) and n(2) degrees of freedom respectively. Also let theta sub l and theta sub p be the smallest and largest roots of S(1)(S(1) + S(2)) to the -1st power. Tables are given for the exact values of A for p = 2 (1) 10, alpha = 0.10, 0.05, 0.025, 0.01, r = 0 (1) 5, 7, 10, 15, n = 5 (1) 10 (2) 20 (5) 50 where r = (n(1) - p - 1)/2, n = (n(2) p - 1)/2 and P(1 - A < or = theta sub l < or = theta sub l < or = A) = 1 - alpha. Author (GRA)

N72-28607# Picatinny Arsenal, Dover, N.J.
A FORTRAN PROGRAM THAT COMPUTES FISHER'S EXACT METHOD OF COMPARING TWO PERCENTAGES
Donald C. Rappaport Mar. 1972 16 p refs
(AD-739913; PA-TR-4330) Avail: NTIS CSCL 12/1

A FORTRAN computer program was devised which computes Fisher's exact method of comparing two percentages. The probability derived from this program can be used in making ordnance design decisions. The capacity and efficiency have been increased over other known methods. Author (GRA)

N72-28608# California Univ., Berkeley.
ON SOME ANALOGUES TO LINEAR COMBINATIONS OF ORDER STATISTICS IN THE LINEAR MODEL
P. J. Bickel 1970 46 p refs Prepared in cooperation with Princeton Univ., N. J.
(Contract N00014-67-A-0114-0004)
(AD-728980) Avail: NTIS CSCL 12/1

The report discusses the problem of estimating the regression parameters of a linear model as the number of observations becomes large and the number of regression parameters remains fixed. Author (GRA)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N72-28609 National Lending Library for Science and Technology, Boston Spa (England).
LAG RELATION BETWEEN MAY RAINFALL IN SHIKOKU AND LONG-PERIOD CIRCULATION ANOMALIES IN THE PRECEDING MONTHS: A LONG-RANGE FORECAST TECHNIQUE
T. Matsuoka [1969] 9 p refs Transl. into ENGLISH from Kishocho Kenkyu Jiho (Tokyo), v. 21, 1969 p 387-394
(NLL-M-22068-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The relation between May rainfall and the mean 500 mb contour for the mountain areas in Shikoku area is investigated. It is determined that May rainfall is closely related not only to May circulation but also to anomalous circulation during the preceding three months. (1) In wet Mays the Far East trough stays in West Japan, and in dry Mays it is over Japan (in-trough situation). In wet Mays the anomalous southerly is dominant over the East China Sea, and the northerly is dominant in dry Mays. (2) The in-trough situation is intensified from February to April before wet Mays. Before dry Mays the anomalous westerly wind blows harder than usual keeping the cold polar air to the North, and the Far East trough is shallow. Author

N72-28610 National Lending Library for Science and Technology, Boston Spa (England).
THE FOG REGIME OVER THE INTERNATIONAL AIRPORT AT SOFIA AND AN ATTEMPT AT THE FORECASTING OF FOG THERE
N. Godev and G. Korcev [1971] 8 p ref Transl. into ENGLISH from Hidromet. Sluz., Hidr. Met. (Bulgaria), v. 20, no. 3, 1971 p 19-28
(NLL-M-22087-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The climatic fog regime over the Sofia plain, and a method based on multifactor discriminant analysis for forecasting radiation fogs, those resulting from radiative cooling of the air, are described. During the period from 1963 to 1968, 266 fogs were observed over the airport, 127 being identified as radiation fogs. Most fogs were reported for November through February, with a well-marked maximum in November. The relations of general fogs and radiation fogs to temperature, time of day, relative humidity, and wind speed are also described. It is concluded that fog is difficult to predict but that multifactor discriminant analysis can solve a number of important problems connected with radiation fog formation. N.E.N.

N72-28611 National Lending Library for Science and Technology, Boston Spa (England).
THERMAL INTERACTION BETWEEN OCEAN AND ATMOSPHERE
N. A. Bagrov and N. I. Mercalova [1970] 11 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchn.-Issled. Tsentr. SSSR (Leningrad), no. 64, 1970 p 24-34 No diagrams, etc.; to be used in conjunction with original book
(NLL-M-22358-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The thermal effect of the atmosphere on the subsequent state of the sea and the thermal effect of the ocean surface on the subsequent state of the atmosphere are investigated for application to long range forecasting. The study is limited to large-scale changes in the sea state and the atmosphere directly above the sea, and only data on the North Atlantic are used. The thermal interaction is estimated by the method of correlation of vectors, and details of the method are given. Simultaneous correlation is more apparent in the summer months than in winter. The air temperature was found to have at least as great an effect on the thermal state of the sea as the sea has on the subsequent state of the atmosphere. Possible explanations of this unexpected result are discussed. N.E.N.

N72-28612 National Lending Library for Science and Technology, Boston Spa (England).
SPECIAL FEATURES OF THE EXPANSION OF METEOROLOGICAL FIELDS IN SYSTEMS OF ORTHOGONAL FUNCTIONS
G. A. Karpeev [1970] 18 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchn.-Issled. Tsentr. SSSR (Leningrad), no. 64, 1970 p 69-80 No diagrams, etc.; to be used in conjunction with original book
(NLL-M-22356-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The expansion of meteorological fields in natural orthogonal functions is developed using a 1 to 1 correspondence between the space-time statistical structure of the field, and the statistical structure of vectors in the arithmetical space which they generate. The equations for the eigenvalues and eigenvectors for the orthogonal transformation matrix are derived. It is concluded that the transformation of fields represented as vectors in a linear space is a convenient mathematical tool for studying the 3-dimensional statistical properties of fields for analysis and forecasting. F.O.S.

N72-28613 National Lending Library for Science and Technology, Boston Spa (England).
SOME REGULARITIES IN THE VERTICAL DISTRIBUTION OF AIR TEMPERATURE AT A HEIGHT OF 1 - 3 km OVER LAND AND SEA
V. E. Golubev [1972] 20 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchn.-Issled. Tsentr. SSSR (Leningrad), no. 68, 1970 p 75-92 No diagrams, etc.; to be used in conjunction with original book

(NLL-M-22335-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The vertical temperature distribution was studied over land in the Moscow region and over water in the North Atlantic Ocean. Day and night profiles were obtained over the land region from aircraft soundings during July, from 1952 through 1961. The vertical distribution depends to a considerable extent on the effect of clouds, which also decrease the adiabatic lapse rate and the height to which the lapse rate extends. For the temperature profile over the ocean, hydrometeorological, balloon sounding, and radiosonde data were used. The convective flow, due to the higher temperature of the water than air at the ocean-atmosphere interface for most of the year, is the dominant factor. The character of air flow over the waves and the wind speed also play a decisive part. N.E.N.

N72-28614 National Lending Library for Science and Technology, Boston Spa (England).

ANALYSIS AND FORECASTING OF SHOWER PRECIPITATION

E. M. Orlova [1972] 25 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchn.-Issled. Tsentr. SSSR (Leningrad), no. 68, 1970 p 3-21 No diagrams, etc.; to be used in conjunction with original paper

(NLL-M-22340-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

A method of calculating the air temperature and dew point profiles, and the amount and duration of steady and shower precipitation on the basis of the profiles is presented. Horizontal trajectories of air parcels, vertical velocities, heat transfer from and to the earth surface, dew point fields, and changes in tha profiles due to entrainment of air from the surroundings are discussed. Rules for calculating the precipitation and forecasting showers are given along with examples. The case of considerable precipitation in a short time is also analyzed.

N.E.N.

N72-28615 Freie Univ., Berlin (West Germany).

METEOROLOGICAL DATA. VOLUME 126, NO. 2: WEATHER SATELLITE OBSERVATIONS IN THE BERLIN RECEPTION AREA. THE EUROPEAN CLIMATOLOGY 1971, PART 2 [METEOROLOGISCHE ABHANDUANGEN. BAND 126, HEFT 2: DAS EUROPAEISCHE WETTERBILD 1971 WETTERSATELLITEN-DATEN AUS DEM BERLINER EMPFANGSBEREICH, TEIL 2]

1971 210 p In GERMAN

(QR-2-Pt-2) Avail: Issuing Activity

Weather charts of Europe for the year 1971 are presented. The daily charts for the period 1 April to 6 May 1971 were developed from ESSA 8 satellite data. The NOAA 1 satellite provided data from 7 May to 20 June 1971. ESSA 8 satellite data were used again from 20 June to 30 June 1971.

Transl. by P.N.F.

N72-28616 World Meteorological Organization, Geneva (Switzerland).

DISPERSION AND FORECASTING OF AIR POLLUTION

R. E. Munn, A. E. J. Eggleton, L. Facy, D. H. Pack, and F. H. Schmidt 1972 125 p refs

(WMO-319; TN-121) Copyright. Avail: Issuing Activity

Progress in the state of the art of dispersion theory and practice is considered. The height to which a buoyant plume will rise is discussed. The theoretical considerations are briefly outlined and a number of empirical formulae presented. The classical expression for diffusion is also discussed, as it relates to transport and diffusion in nonurban environments. The effect of cities on the transport and dispersion of pollutants. A review of the urban microclimate and models for various types of sources are presented. Finally chemical reactions and removal processes over cities are discussed. The forecast aspect of meteorological services for air pollution abatement are treated. A detailed description is presented for atmospheric diffusion investigations in the U.S.S.R. Author

N72-28617 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.

METEOROLOGICAL DATA. VOLUME 119, NO. 1: WEATHER SATELLITE OBSERVATIONS AND THEIR EVALUATION. THE EUROPEAN CLIMATOLOGY 1970, PART 1 [METEOROLOGISCHE ABHANDLUGEN. BAND 119, HEFT 1: WETTERSATELLITENBEOBACHTUNGEN UND IHRE AUSWERTUNG. DAS EUROPAEISCHE WETTERBILD 1970, TEIL 1, 1. VIERTELJAHR]

1971 265 p refs In GERMAN; ENGLISH summary

(QR-1-Pt-1) Avail: Issuing Activity

Meteorological and climatological charts of Europe are presented. The data for the charts were obtained from observations made by ITOS 1 and METEOR 3 meteorological satellites. Descriptions of the satellites and their systems are included. A group of selected conventional snow and ice maps are published.

Author

N72-28618 Freie Univ., Berlin (West Germany).

METEOROLOGICAL DATA. VOLUME 119, NO. 2: WEATHER SATELLITE OBSERVATIONS AND THEIR EVALUATION. THE EUROPEAN CLIMATOLOGY 1970, PART 2 [METEOROLOGISCHE ABHANDLUNGEN. BAND 119, HEFT 2: WETTERSATELLITENBEOBACHTUNGEN UND IHRE AUSWERTUNG DAS EUROPAEISCHE WETTERBILD 1970, TEIL 2]

1971 305 p refs In GERMAN; ENGLISH summary

(QR-2-Pt-2) Avail: Issuing Activity

Brief reviews of meteorological satellite studies are followed by an article dealing with the American weather satellite Nimbus 4. Special attention is given to the new radiation experiment carried out with Nimbus 4, including descriptions of preliminary results. Some statements about the Russian meteorological satellites Meteor 4 and Meteor 5 and a detailed view of snow and ice distribution as seen in satellite pictures of the extremely cold winter 1969/70 are included. Also attached are quarterly collections of the European climatology together with some orbital data and picture taking times. Author

N72-28619 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie und Geophysik.

METEOROLOGICAL DATA. VOLUME 115, NO. 8: RESULTS OF THE ASCENTS OF THE RADIOSONDE STATION, BERLIN-TEMPELHOF, OF THE INSTITUT FUER METEOROLOGIE UND GEOPHYSIK OF THE FREIE UNIVERSITAET BERLIN, AUGUST 1970. DAILY MEASUREMENTS, MONTHLY COMPILATION AND CLIMATOLOGICAL VALUES AS WELL AS RESULTS OF SPECIAL ASCENTS [METEOROLOGISCHE ABHANDLUNGEN. BAND 115, HEFT 8: ERGEBNISSE DER AUFSTIEGE DER RAPIOSONDENSTATION BERLIN-TEMPELHOF DES INSTITUTS FUER METEOROLOGIE UND GEOPHYSIK DER FREIEN UNIVERSITAET BERLIN IM JAKHRE 1970, AUGUST. TAEGLICHE MESSRESULTATE, MONATLICHE BEARBEITUNG UND KLIMATOLOGISCHE WERTE SOWIE MESSERGEBNISSE VON SPEZIALAUFSTIEGEN]

Eugen Pantzke, Richard Scherhag et al 1970 188 p In GERMAN; ENGLISH summary

Avail: Issuing Activity

Data obtained from radiosonde ascents performed by the aerological station of the Institute for Meteorology and Geophysics of the Free University of Berlin, Germany are presented. Monthly time cross sections of the averaged temperature and the meridional and zonal wind components in heights above 30 kilometers are constructed. Extreme and mean values of the temperature, pressure, geopotential, wind data, refractivity, the tropopause, and the freezing level are reported. The data of the ozone-ascents are given in tabular and graphic form. The data are based on daily observations for the month of August, 1970.

Author

N72-28620 Freie Univ., Berlin (West Germany).

METEOROLOGICAL DATA. VOLUME 122, NO. 7: AEROLOGICAL DATA, BERLIN-TEMPELHOF, JULY 1971

[METEOROLOGISCHE ABHANDLUNGEN. BAND 122, HEFT 7: AEROLOGISCHE DATEN BERLIN-TEMPELHOF, JULI 1971]
1971 165 p In GERMAN
Avail: Issuing Activity

Data obtained from the radiosonde ascents performed by the aerological station of the institute for Meteorology of the Free University of Berlin are presented. Extreme and mean values of the temperature, pressure, geopotential, wind data, refractivity, pseudopotential temperature, and velocity of sound were extracted for all standard pressure surfaces, several height levels, the tropopause, and the freezing level. The temperature curve of the climatological mean and the data of the ozone-ascents are given in tabular and graphical form. The period covered is July 1971. Author

N72-28621 Freie Univ., Berlin (West Germany).
METEOROLOGICAL DATA. VOLUME 19, NO. 3: DAILY ALTITUDE MAPS OF THE 30 mb LEVEL AS WELL AS MONTHLY MEAN MAPS FOR 1961, PART 3 (REVISED) [METEOROLOGISCHE ABHANDLUNGEN. BAND 19, HEFT 3: TAEGLICHE HOEHENKARTEN DER 30 mb-FLAECHE SOWIE MONATLICHE MITTELKARTEN FUER DAS JAHR 1961 (NEUE BEARBEITUNG)]
Ingrid Buschner, Barbara Kriester, Karin Labitzke, and Richard Scherhag 1968 105 p In GERMAN
(QR-3-Pt-3) Avail: Issuing Activity

Daily stratospheric height charts for the 30 mb level are presented for the period July through September, 1961. Also included are mean monthly charts for the year 1961 and a brief evaluation of the middle atmospheric circulation during the third quarter of the same year. Transl. by G.G.

N72-28622 National Lending Library for Science and Technology, Boston Spa (England).
APPLICATION OF EMPIRICAL ORTHOGONAL FUNCTIONS TO A SYNOPTIC WEATHER SITUATION
R. Joelsson [1972] 18 p Transl. into ENGLISH of Meteorol. and Hydrol. Inst. of Sweden, Stockholm, report No diagrams etc.; to be used in conjunction with original paper
(NLL-M-22302-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The application of Holstrom's orthogonal equation to the geopotential as a function of pressure, wind and temperature was studied at the 1000, 500 and 100 mb levels. The temperature and wind fields were calculated for the same synoptic situation by two sets of empirical orthogonal functions to determine the accuracy in using the Holmstrom functions for describing the horizontal and vertical structure of synoptic situations. It is concluded that more research is required for proper interpretation of calculation using orthogonal functions. F.O.S.

N72-28623 National Lending Library for Science and Technology, Boston Spa (England).
THE QUASI-BIENNIAL OSCILLATION IN THE SPRING-SUMMER ATMOSPHERIC CIRCULATION
A. I. Ugrjumov [1972] 86 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauch.-Issled. Tsentr. SSSR (Leningrad), no. 77, 1971 82 p
(NLL-M-22385-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 9 NLL photocopy coupons

The quasi-biennial oscillations of the circulation in the equatorial stratosphere are discussed. The circulation regime in the stratosphere as a function of the influx of radiant heat is analyzed along with the influence of the quasi-biennial cycle on the spring reversal in the extra-tropical stratosphere. A discussion, relating the tropospheric circulation to the variations of the spring circulation in the stratosphere is included. It is concluded: that the circulation in the stratosphere of the Northern Hemisphere, in the periods of the spring reversals, is influenced by the equatorial quasi-biennial cycle, which determines the level of meridional exchange, and that the troposphere and the stratosphere should be regarded as two energy-independent systems. F.O.S.

N72-28624 National Lending Library for Science and Technology, Boston Spa (England).
THERMODYNAMICAL PROPERTIES OF AIR MASSES IN THE TROPICAL ATLANTIC
L. V. Kool [1972] 8 p refs Transl. into ENGLISH from Okeanologiya (Moscow), v. 11, no. 4, 1971 p 606-614
(NLL-M-22391-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The thermodynamic characteristics of air masses over the tropical Atlantic are analyzed based on climatological data. Unstable stratification, intense ascending currents, and high heat and moisture content are considered the main properties of the Equatorial air mass. The differences in the properties of tropical maritime air masses in the Eastern and Western Atlantic are discussed in terms of stratification, moisture content, and seasonal variations. F.O.S.

N72-28625 International Geophysical Year World Data Center A, Asheville, N.C.
HIGH ALTITUDE METEOROLOGICAL DATA, VOLUME 7, NO. 8
1972 224 p
Avail: SOD $3.00

Wind and temperature measurements from all available meteorological sounding rocket firings are presented, along with computed values for pressure, density, and speed of sound. Local radiosonde observations nearest the time of firing are included. Statistical tables and graphs of current month means and standard deviations for all parameters with long-term means are also presented. Author

N72-28626 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA, VOLUME 128, NO. 2: RESULTS OF THE SYNOPTIC SERVICE DURING 1972. DAILY AND MONTHLY WEATHER MAPS (GROUND, 500 mb), TABLES AND BRIEF SCIENTIFIC ARTICLES, FEBRUARY [METEOROLOGISCHE ABHANDLUNGEN. BAND 128, HEFT 2: ERGEBNISSE DES SYNOPTISCHEN DIENSTES IM JAHRE 1972. TAEGLICHE UND MONATLICHE WETTERKARTEN (BODEN, 500 mB), TABELLEN UND KLEINERE WISSENSCHAFTLICHE AUFSAETZE, FEBRUAR]
1972 208 p refs In GERMAN
Avail: Issuing Activity

Daily and monthly Northern Hemisphere ground level and 500 mb height and temperature analyses of constant pressure levels for February are presented based on rawinsonde and stratospheric rocket sounding data. Corresponding monthly mean maps, their variations and deviations are included as well as the mean gridpoint data calculated from daily values. Included scientific studies cover aspects of thundershower activities, a North Atlantic typhoon, stratospheric temperature measurements, and meteorological winter sport data. Transl. by G.G.

N72-28627 International Geophysical Year World Data Center A, Asheville, N.C.
HIGH ALTITUDE METEOROLOGICAL DATA, VOLUME 7, NO. 7
1972 241 p
Avail: SOD $3.00

Wind and temperature measurements from all available meteorological sounding rocket firings are presented, along with computed values for pressure, density, and speed of sound. Local radiosonde observations nearest the time of firing are included. Statistical tables and graphs of current month means and standard deviations for all parameters with long-term means are also presented. Author

N72-28628 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA. VOLUME 122, NO. 9: AEROLOGICAL DATA, BERLIN-TEMPELHOF, SEPTEMBER 1971 [METEOROLOGISCHE ABHANDLUNGEN. BAND 122, HEFT 9: AEROLOGISCHE DATEN, BERLIN-TEMPELHOF, SEPTEMBER 1971]
1971 168 p refs In GERMAN; ENGLISH summary
Avail: Issuing Activity

The detailed results of the radiosonde ascents performed by aerological station of the Institut fur Meteorologie der Freien Universitat Berlin are presented. Extreme and mean values of the temperature, pressure, geopotential, wind data, refractivity, pseudopotential temperature and velocity of sound were extracted for all standard pressure surfaces, several height levels the tropopause and the freezing level. The temperature curve of the climatological mean and the data of the ozone-ascents are given in tabular and graphical form. Author

N72-28629 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA. VOLUME 122, NO. 10: AEROLOGICAL DATA, BERLIN-TEMPELHOF, OCTOBER 1971 [METEOROLOGISCHE ABHANDLUNGEN. BAND 122, HEFT 10: AEROLOGISCHE DATEN, BERLIN-TEMPELHOF, OKTOBER 1971]
1971 158 p refs In GERMAN; ENGLISH summary
Avail: Issuing Activity

Extreme and mean values of the temperature, pressure, geopotential, wind data, refractivity, pseudopotential temperature and velocity of sound, were extracted for all standard pressure surfaces, several height levels the tropopause and the freezing level. The temperature curve of the climatological mean and the data of the ozone-ascents were given in tabular and graphical form. Author

N72-28630 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA. VOLUME 122, NO. 8: AEROLOGICAL DATA, BERLIN-TEMPELHOF, AUGUST 1971 [METEOROLOGISCHE ABHANDLUNGEN. BAND 122, HEFT 8: AEROLOGISCHE DATEN, BERLIN-TEMPELHOF, AUGUST 1971]
1971 166 p refs In GERMAN; ENGLISH summary
Avail: Issuing Activity

Extreme and mean values of the temperature, pressure, geopotential, wind data, refractivity, pseudopotential temperature and velocity of sound, were extracted for all standard pressure surfaces, several height levels, the tropopause, and the freezing level. The temperature curve of the climatological mean and the data of the ozone-ascents were given in tabular and graphical form. Author

N72-28631 Freie Univ., Berlin (West Germany).
METEOROLOGICAL DATA, VOLUME 126, NO. 4: THE EUROPEAN CLIMATOLOGY 1971. WEATHER SATELLITE DATA FROM THE BERLIN ZONE OF RECEPTION, PART 4 Quarterly Report [METEOROLOGISCHE ABHANDLUNGEN. BAND 126, HEFT 4: DAS EUROPAEISCHE WETTERBILD 1971.WETTERSATELLITEN-DATEN AUS DEM BERLINER EMPFANGSBEREICH, TEIL 4]
1971 182 p In GERMAN
(QR-4-Pt-4) Avail: Issuing Activity

Weather charts for Europe during the last quarter of 1971 are presented. The charts are based on photography data transmitted by the ESSA 8 satellite. P.N.F.

N72-28632 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA. VOLUME 128, NO. 1: RESULTS OF THE SYNOPTIC SERVICE DURING 1972. DAILY AND MONTHLY WEATHER MAPS (GROUND, 500 mb), TABLES AND BRIEF SCIENTIFIC ARTICLES, JANUARY [METEOROLOGISCHE ABHANDLUNGEN. BAND 128, HEFT 1: ERGEBNISSE DES SYNOPTISCHEN DIENSTES IM JAHRE 1972. TAEGLICHE UND MONATLICHE WETTERKARTEN (BODEN, 500 mB), TABELLEN UND KLEINERE WISSENSCHAFTLICHE AUFSAETZE, JANUAR]
1972 240 p refs In GERMAN; ENGLISH summary
Avail: Issuing Activity

Daily and monthly weather charts and tables for January, 1972 are presented. Climatological charts of the Northern Hemisphere from the surface to the 500 millibar level are developed. Tables of data concerning temperature conditions and related meteorological parameters are included. P.N.F.

N72-28633*# Aerospace Corp., Los Angeles, Calif.
STUDY TO DEMONSTRATE THE FEASIBILITY OF, AND DETERMINE THE OPTIMUM METHOD OF REMOTE HAZE MONITORING BY SATELLITE Progress Report, 10-30 May 1972
Ernest H. Rogers, principal investigator 10 Jul. 1972 1 p
(Contract NAS5-21719)
(E72-10006; NASA-CR-127552; GSFC-ID-PR173;
ERTS-A-Proposal-SR-230) Avail: NTIS HC $3.00 CSCL 04B

This report contains no significant results. Author

N72-28634*# Earth Satellite Corp., Washington, D.C.
FACILITATING THE EXPLOITATION OF ERTS-IMAGERY USING SNOW ENHANCEMENT TECHNIQUES Monthly Progress Report
Frank J. Wobber, principal investigator 7 Jul. 1972 5 p
Sponsored by NASA
(E72-10007; NASA-CR-127551; GSFC-ID-sr141;
ERTS-A-Proposal-SR-141) Avail: NTIS HC $3.00 CSCL 04B

This report contains no significant results. Author

N72-28635# Chicago Univ., Ill. Cloud Physics Lab.
A STUDY OF THE INITIAL PHASE OF CLOUD DROPLET GROWTH BY CONDENSATION: COMPARISON BETWEEN THEORY AND OBSERVATION Ph.D. Thesis
James W. Fitzgerald Jun. 1972 156 p refs
(Grants NSF GA-28190X; NSF GA-20470; NSF GA-11088; NSF GA-1590; NSF GA-851)
(TN-44) Avail: NTIS HC $10.00

A study was made of the extent to which the model of the evolution of a cloud droplet size distribution by condensation upon a population of pure hygroscopic nuclei in an adiabatic and laminar updraft is applicable to the initial phase of cloud droplet spectrum formation near the base of small to moderate-sized, growing, nonprecipitating cumuli. The droplet size distribution measured at a height between 200 and 300 meters above the base of a selected cloud was compared with that predicted by the model using a constant updraft speed equal to the horizontally averaged updraft velocity measured several hundred feet below the cloud, a size distribution of NaCl nuclei inferred from a measurement of the supersaturation spectrum of cloud condensation nuclei in the air rising to cloud base, and the actual cloud base temperature and pressure. Clouds were sampled near Bemidji, Minn., and Miami, Fla., including clouds formed over the ocean and over the peninsula. Author

N72-28636# National Aviation Facilities Experimental Center, Atlantic City, N.J.
EVALUATION OF THE NAS EN ROUTE STAGE A MODEL 3D WEATHER AND FIXED MAP UNIT Final Report, Oct. 1970 - Aug. 1971
Robert W. Delaney Jun. 1972 124 p
(Proj. 119-016-00X)
(FAA-RD-72-52) Avail: NTIS HC $8.25

The first preproduction model of a weather and fixed map unit (WFMU) was installed along with a modification to the production common digitizer (PCD) for generating contours around weather clutter. The WFMU processed contours at two

intensity levels at controlled maximum range and azimuth intervals which were formulated into weather map messages and transmitted over modems to the operational facility. Design changes were introduced to optimize the weather subsystem effectiveness. Calibration methods and trouble shooting aids were established for use by field personnel. It was concluded that the WFMU was capable of generating reliable contours around weather clutter and was not affected by aircraft signals. Log and MTI videos of 4.0 volts with a noise level adjusted to a nominal 0.75 (+ or - 0.5) volts mean peak were necessary to achieve clutter estimate calibration of weather contours. Effective control of weather map data rates was accomplished by a weather discrimination feature in the PCD and by a sampling arrangement in the WFMU that transmitted the contours at one-third the display resolution. It is recommended that WFMU transmission intervals for outer and inner contours be selected for display resolution of 2.8 and 0.7 deg, respectively. Author

N72-28637# American Meteorological Society, Washington, D.C.
CONFERENCE ON CLOUD PHYSICS
Aug. 1970 218 p refs Conf. held at Fort Collins, Colo., 24-27 Aug. 1970
Avail: NTIS HC $13.00

Abstracts of conference papers on cloud physics are presented. The areas of interest are the following: instruments, nuclei, ice, water drops, microdynamics, and mesoscale phenomena. N.E.N.

N72-28638*# Allied Research Associates, Inc., Baltimore, Md.
FOUR-DIMENSIONAL WORLD-WIDE ATMOSPHERIC MODELS (SURFACE TO 25 KM ALTITUDE)
David B. Spiegler and Mary G. Fowler Washington NASA Jul. 1972 74 p refs
(Contract NAS8-26928)
(NASA-CR-2082; REPT-9G-88F) Avail: NTIS HC $3.00 CSCL 04B

Four-dimensional atmospheric models previously developed for use as input to atmospheric attenuation models are evaluated to determine where refinements are warranted. The models are refined where appropriate. A computerized technique is developed that has the unique capability of extracting mean monthly and daily variance profiles of moisture, temperature, density and pressure at 1 km intervals to the height of 25 km for any location on the globe. This capability could be very useful to planners of remote sensing of earth resources missions in that the profiles may be used as input to the attenuation models that predict the expected degradation of the sensor data. Recommendations are given for procedures to use the four-dimensional models in computer mission simulations and for the approach to combining the information provided by the 4-D models with that given by the global models. Author

N72-28639# Finnish Meteorological Inst., Helsinki.
NUMERICAL WEATHER PREDICTION IN FINLAND DURING 1969
Daniel Soederman Dec. 1971 22 p refs
(TR-1) Avail: NTIS HC $3.25

The numerical weather prediction activities in Finland during 1969 are presented. The report includes a comparison of weekly 96 hour barotropic forecasts with the corresponding Swedish routine forecasts for the 500 mb level and verification of 52 cases of baroclinic 36 hour forecasts, computed by using five separate versions of a filtered three-parameter model for each synoptic situation. Author

N72-28640# National Center for Atmospheric Research, Boulder, Colo.
DATA CATALOG FOR THE 1970 COLORADO LEE WAVE OBSERVATIONAL PROGRAM
D. Lilly, Y. Pann, P. Kennedy, and W. Toutenhookd Dec. 1971 194 p refs Sponsored by NSF
(NCAR-TN/STR-72) Avail: NTIS HC $11.75

The data obtained in the intensive measurements of mountain induced airflow over the central Rocky Mountains for the 1970 Colorado Lee Wave Observational Program are presented. The topography and flight paths are described along with the aircraft characteristics and instrumentation. F.O.S.

N72-28641# National Center for Atmospheric Research, Boulder, Colo.
DIGITAL CONTROL OF METEOROLOGICAL SYSTEMS
P. K. Govind Jan. 1972 24 p refs Sponsored by NSF
(NCAR-TN/STR-73) Avail: NTIS HC $3.25

The state-variable matrix approach of modern control theory is applied to a multi-input, multi-output meteorological network. The problem of providing suitable controllers to stabilize the outputs in the presence of deteriorating input parameters is discussed. Numerical simulation of an illustrative example was performed on a digital computer. Author

N72-28642# National Center for Atmospheric Research, Boulder, Colo.
COMPLETE 100- AND 200-mb GHOST BALLOON DATA: 1966-1970
Samuel B. Solot Feb. 1972 163 p refs Sponsored by NSF
(NCAR-TN/STR-75) Avail: NTIS HC $10.25

All useful 100- and 200-mb data obtained by GHOST balloons from 1966 through 1970, not previously published, are presented. The GHOST observation system is described along with the curve-fitting techniques used in data analysis. F.O.S.

N72-28643# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
AN AUTOMATIC CENTRALIZER FOR MONITORING ATMOSPHERIC PARAMETERS
Roger Monet, Jacques Peulve, and Gerard Cartoux Dec. 1971 33 p In FRENCH
(CEA-N-1508) Avail: AEC Depository Libraries

The radiological protection service utilizes an automatic information centralizer for atmospheric measurements. It facilitates the monthly presentation of results, climate studies on the site, and studies of the fine structure of the biosphere. The assembly, which is adapted for both routine measurements and nonroutine projects, can supply information from some or all of its 32 probes. Although the system is adapted to information storage, in view of a computerized treatment, the measurements can be instantaneously displayed and the evolution of atmospheric phenomena can be followed. Author (NSA)

N72-28644# Istituto di Fisica Dell Atmosfera, Rome (Italy).
REPORT ON THE ORGANIZATIONAL, SCIENTIFIC AND DIDACTIC ACTIVITY OF THE INSTITUTE OF ATMOSPHERIC PHYSICS FOR THE FISCAL YEAR 1970 [RELAZIONE SULL'ATTIVITA ORGANIZZATIVA SCIENTIFICA E DIDATTICA DELL'IFA]
Feb. 1971 134 p refs In ITALIAN
(IFA-TR-33) Avail: NTIS HC $8.75

Activities and research programs carried out during 1970 are described. They include: general meteorology, applied meteorology and climatology, atmospheric microphysics, physics of meteoroids and the upper atmosphere, aeronomy and magnetospheric physics, atmospheric optics, atmospheric electricity, and radioactivity. Educational activities are also mentioned. ESRO

N72-28645# Istituto di Fisica Dell Atmosfera, Rome (Italy).
ENVIRONMENTAL POLLUTION IN LATIUM, PARTICULARLY ATMOSPHERIC POLLUTION [L'INQUINAMENTO AMBIENTALE NEL LAZIO CON PARTICOLARE RIGUARDO A QUELLO ATMOSFERICO]
Luigi Mammarella Mar. 1971 21 p refs In ITALIAN
(IFA-RDP-39) Avail: NTIS HC $3.25

The various sources of environmental pollution in the region of Rome are examined. It is concluded that air pollution is the major field of concern, followed by water pollution. In Rome, air pollution is mainly due to central heating (60%), exhaust gases from urban traffic (30%), and industrial wastes only represent 10%. The picture tends to shift due to countermeasures in the central heating area, and an increase in traffic. Human wastes cause a large amount of pollution of the rivers. ESRO

N72-28646# Istituto di Fisica Dell Atmosfera, Rome (Italy).
ENVIRONMENTAL POLLUTION AND ITS RELATION TO URBAN PLANNING AND THE MICROMETEOROLOGY OF CITIES [L'INQU INAMENTO AMBIENTALE E I SUOI RAPPORTI CON L'ASSETTO URBANISTICO E LA MICROMETEOROLOGIA DEGLI AGGLOMERATI URBANI]
Luigi Mammarella Dec. 1970 12 p refs In ITALIAN
Presented at the 1st Bien. Conf. on "Le Forme Dell'Ambiente Umano", Rimini, Italy, 20-25 Sep. 1970
(IFA-RDP-34) Avail: NTIS HC $3.00

Various sources of environmental pollution are outlined and their relation to urban planning and micrometeorology is described. ESRO

N72-28647# Istituto di Fisica Dell Atmosfera, Rome (Italy).
PROGRESSION OF URBAN ATMOSPHERIC POLLUTION (COMPARISON OF POLLUTION RATE DURING DIFFERENT SEASONS IN A LARGE RESIDENTIAL AREA) [ANDAMENTO DELL'INQUINAMENTO ATMOSFERICO URBANO (COMPARAZIONE DEI VALORI DI INQUINAMENTO INTERSTAGIONALI IN UN QUARTIERE RESIDENZIAL ESTENSIVO)]
L. Mammarella Feb. 1971 115 p refs In ITALIAN; ENGLISH summary
(IFA-TR-35) Avail: NTIS HC $7.75

A characterization of aerosol pollution was made in a large residential area (Rome-Eur) as part of a more extensive investigation in the Rome urban area. The investigations were carried out mainly by means of aerosol differential samplers during two different seasons (autumn and winter). The two phases made possible a subdivision between traffic and combustion pollution. The mean pollution level of the zone under investigation appears fairly high in view of the fact that the area is full of green spaces and parks. The intensity of the traffic and the presence of big buildings (ministeries or large commercial firms) may be the reason for a large number of aerosols. ESRO

N72-28648# Istituto di Fisica Dell Atmosfera, Rome (Italy).
REPORT ON THE ORGANIZATIONAL, SCIENTIFIC AND EDUCATIONAL ACTIVITIES OF THE ISTITUTO DI FISICA DELL' ATMOSFERA FOR THE FISCAL YEAR 1971 [RELAZIONE SULL'ATTIVITA ORGANIZZATIVA SCIENTIFICA E DIDATTICA DELL'ISTITUTO DIFISICA DELL'ATMOSFERA NELL'ESERCIZIO FINANZARIO 1971]
Feb. 1972 107 p refs In ITALIAN
(IFA-TR-40) Avail: NTIS HC $7.50

Studies made in the fields of meteorology, airport visibility, atmospheric pollution, and structure and dynamics of the upper atmosphere are summarized. Atmospheric temperature and meteoroids were studied using radar techniques developed for this purpose. Atmospheric pollution by nitrogen and sulfur oxides was investigated, and natural and contaminant radioactivity was measured. Infrared studies of spectral attenuation of the solar radiation and of sea-air and snow-air boundaries were carried out. Educational activities are also mentioned. ESRO

N72-28649# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Apr. 1972 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, AVRIL 1972]
R. Sneyers Apr. 1972 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.00

Meteorological parameters observed at different Belgian weather stations during April 1972 are given. ESRO

N72-28650# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION, SMOKE, AND SULFUR DIOXIDE Monthly Bulletin, Jul. 1971 [POLLUTION ATMOSPHERIQUE, FUMEE ET ANHYDRIDE SULFUREUX BULLETIN MENSUEL, DECEMBRE 1969]
Jul. 1971 28 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $3.50

Data obtained at Belgian weather stations are tabulated. The air pollution apparatus is briefly described. ESRO

N72-28651# RAND Corp., Santa Monica, Calif.
AN EXPERIMENT ON THE SENSITIVITY OF A GLOBAL CIRCULATION MODEL: STUDIES IN CLIMATE DYNAMICS FOR ENVIRONMENTAL SECURITY
M. Warshaw and R. R. Rapp Feb. 1972 35 p refs
(ARPA Order 189-1)
(AD-739676; R-908-ARPA) Avail: NTIS CSCL 04/2

Results are given for a series of six 60-day integrations of the Mintz-Arakawa two-level, global-circulation model, designed to test the hypothesis that sizable changes in boundary conditions could be detected in the solutions even in the presence of uncertainties in the initial conditions. The variables considered are zonally averaged and time averaged values from the last 30 days of each 60-day run; the significance of the changes is tested by a classical analysis-of-variance technique. Author (GRA)

N72-28652# RAND Corp., Santa Monica, Calif.
A DOCUMENTATION OF THE MINTZ-ARAKAWA TWO LEVEL ATMOSPHERIC GENERAL CIRCULATION MODEL
W. L. Gates, E. S. Batten, A. B. Kahle, and A. B. Nelson Dec. 1971 417 p refs
(Contract DAHC15-67-C-0141; ARPA Order 189-1)
(AD-740093; R-877-ARPA) Avail: NTIS CSCL 04/2

Summary of the physical bases of the Mintz-Arakawa two-level atmospheric model and presentation of numerical procedures and computer program for its execution. Discussion covers the physics of the model, with particular attention given to the treatment of the moisture and heat sources, including parameterization of convective processes, cloudiness, and radiation. Numerical approximations and finite-difference equations used in the numerical simulations are also given. To facilitate the use of this model, a complete listing of the code as written in FORTRAN language is given, together with a description of all constants and parameters used. Also invluded are a dictionary of FORTRAN variables and a dictionary of principal physical features. Author (GRA)

N72-28653# Computer Sciences Corp., Falls Church, Va.
MARINE WEATHER DISSEMINATION SYSTEMS STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report, Aug. 1970 - Aug. 1971
B. J. Crowe 16 Aug. 1971 20 p
(Contract DOT-CG-00579-A)
(AD-739947; DOT-CG-00579A-0-Vol-1) Avail: NTIS CSCL 04/2

Work performed during a study of Marine Weather Dissemination Systems is summarized. The study examined existing and planned systems for disseminating weather and other environmental information to marine users, and made objective, comparative measurements of the effectiveness of each of the systems. Based dn these analyses, recommendations were made for changes which would improve the service to the marine user. The recommendations were addressed to the policies, facilities and procedures of the Coast Guard and other government and non-government agencies. Finally, guidelines were generated for future Coast Guard research and development efforts on advanced alerting and dissemination systems to serve recreational boatmen. Author (GRA)

N72-28654# Computer Sciences Corp., Falls Church, Va.
MARINE WEATHER DISSEMINATION SYSTEMS STUDY. VOLUME 2: SYSTEMS CHARACTERIZATION Final Report, Aug. 1970 - Aug. 1971
B. J. Crowe and E. Holliman 16 Aug. 1971 200 p refs
(Contract DOT-CG-00579-A)
(AD-739948; DOT-CG-00579A-1-Vol-2) Avail: NTIS CSCL 04/2

Systems for disseminating weather information to marine users are described in detail. Coast Guard and National Weather Service transmitting facilities are listed, giving location, name, call sign, transmitting power, mode, frequency, and antenna height. Coastal display stations and telephone facilities are also listed. Facilities serving off-shore and high-seas areas are described. Operating policies and procedures for all systems are documented. The work described was performed in the first phase of a study aimed at improving the dissemination of weather information to marine users and at establishing guidelines for future Coast Guard research and development efforts in this field. Author (GRA)

N72-28655# Computer Sciences Corp., Falls Church, Va.
MARINE WEATHER DISSEMINATION SYSTEMS STUDY. VOLUME 3: SYSTEMS EFFECTIVENESS MEASUREMENT Final Report, Aug. 1970 - Aug. 1971
B. J. Crowe, G. M. Fereno, and E. Holliman 16 Aug. 1971 326 p refs
(Contract DOT-CG-00579-A)
(AD-739949; DOT-CG-00579A-2-Vol-3) Avail: NTIS CSCL 04/2

Systems effectiveness of marine weather dissemination systems is measured against carefully established criteria. First level effectiveness, accessibility, is measured in terms of coverage, audience, and system schedule. Second level effectiveness is examined in terms of timeliness. The analysis addresses systems operated by the U.S. Coast Guard, the National Weather Service, public coast stations and commercial broadcasters. The work described was performed in the second phase of a study aimed at improving the dissemination of weather information to marine users and at establishing guidelines for future Coast Guard research and development efforts in this field. Author (GRA)

N72-28656# Computer Sciences Corp., Falls Church, Va.
MARINE WEATHER DISSEMINATION SYSTEMS STUDY. VOLUME 4: RECOMMENDATIONS FOR CHANGE Final Report, Aug. 1970 - Aug. 1971
B. J. Crowe and E. Holliman 16 Aug. 1971 68 p
(Contract DOT-CG-00579-A)
(AD-739950; DOT-CG-00579A-3-Vol-4) Avail: NTIS CSCL 04/2

Potential improvements in existing and proposed weather dissemination systems are examined. Recommendations are made for changes in the policies, facilities and procedures of the U.S. Coast Guard and other government and non-government agencies aimed at effecting realistic improvements in system service. Service to coastal, off-shore and high seas areas is discussed. The work described was performed in the third phase of a study aimed at improving the dissemination of weather information to marine users and at establishing guidelines for future Coast Guard research and development efforts in this field. Author (GRA)

N72-28657# Computer Sciences Corp., Falls Church, Va.
MARINE WEATHER DISSEMINATION SYSTEMS STUDY. VOLUME 5: GUIDELINES FOR FUTURE COAST GUARD RESEARCH AND DEVELOPMENT Final Report, Aug. 1970 - Aug. 1971
B. J. Crowe and E. Holliman 16 Aug. 1971 117 p refs
(Contract DOT-CG-00579-A)
(AD-739951; DOT-CG-00579A-4-Vol-5) Avail: NTIS CSCL 04/2

Systems objectives for advanced alerting and dissemination systems for recreational boatmen are established. Parametric data are presented as a baseline for future initial design efforts on systems to disseminate weather and environmental information to marine users and to alert them to impending hazardous conditions. Areas are identified in which further data are required for systems analysis and design. The work described was performed in the final phase of a study aimed at improving the dissemination of weather information to marine users and at establishing guidelines for future Coast Guard research and development efforts in this field. Author (GRA)

N72-28658# National Oceanic and Atmospheric Administration, Rockville, Md.
APPLICATION OF METEOROLOGICAL SATELLITE DATA IN ANALYSIS AND FORECASTING
Ralph R. Anderson and Arthur H. Smith (Environ. Tech. Appl. Center (Air Force)) Nov. 1971 66 p refs
(AD-740017; ESSA-TR-NESC-51; NOAA-AWS-TR-212) Avail: NTIS GPO HC $0.65 as SN-0314-0313 CSCL 04/2

Infrared (IR) sensors measure long-wave radiation emitted by cloud, land and water surfaces. These measurements are converted to temperatures which generally represent the temperatures of the surfaces viewed. The IR data are obtained by a scanning radiometer (SR) which measures radiances in the 10.5 to 12.5 micro portion of the electromagnetic spectrum. These measurements are recorded and processed by computer to provide global coverage. IR measurements commonly are converted to imagery in which the clouds and earth appear as different shades of gray. The darkest areas represent the warmest surfaces, while the brightest represent the coldest surfaces. IR imagery also shows relative cloud height. Satellite television pictures measure reflected sunlight in the visible spectral range. Dark areas correspond to areas with low albedo while bright areas are produced by highly reflective surfaces.
Author (GRA)

N72-28659# Boeing Co., Wichita, Kans.
ADDITIONAL RESEARCH OF LOW ALTITUDE TURBULENCE DATA Final Technical Report, Jul. - Sep. 1971
Joe D. Gault Wright-Patterson AFB, Ohio AFFDL Sep. 1971 51 p refs
(Contract F33615-71-C-1836; AF Proj. ADP-682E)
(AD-739875; AFFDL-TR-71-150) Avail: NTIS CSCL 04/2

The report presents procedures, analysis methods and results pertaining to a more detailed study of several data samples recorded during the Low Altitude Atmospheric Turbulence Program (LO-LOCAT, Phase III). Wind spectra corrected for airplane motion effects and gust velocity calculated using filtered input parameters substantiated the original results obtained during LO-LOCAT, Phase III. Author (GRA)

N72-28660# TRW Systems, Redondo Beach, Calif.
AIR QUALITY IMPLEMENTATION PLAN FOR THE STATE OF ALASKA. VOLUME 1: CONTROL STRATEGY
Dec. 1971 101 p refs Prepared for State of Alaska. Dept. of Environ. Conservation
(Contract EPA-68-02-0048)
(PB-207700; APTD-0926-Vol-1; Rept-18425.007) Avail: NTIS CSCL 13B

A control strategy designed to achieve and maintain air quality data in Alaska is presented. The control strategy consists of a set of control measures and procedures to be carried out and enforced by the State and Regional Air Quality Control Agencies. A technical summary of the Strategy is given. Section I presents an executive summary of the Strategy. It describes briefly the air quality problem in Alaska, the background for the problem solution, and the control strategy. The subsequent four sections treat details of control Strategies for each of the four Alaska Air Quality Control Regions. These sections present for each region, the region description, the existing regional air quality, the sources of pollutants, the proposed control strategy and finally the economic aspects of the control Strategy.
Author (GRA)

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N72-28661 National Lending Library for Science and Technology, Boston Spa (England).
HORIZONTAL RUNWAY VISUAL RANGE
M. Ja. Racimor [1970] 11 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchn.-Issled. Tsentr. SSSR (Leningrad), v. 70, 1970 p 9-18 No diagrams etc.; to be used in conjunction with original book
(NLL-M-22355-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A method for identifying the horizontal visual range on the runway considered in connection with the takeoff and landing of aircraft is discussed. The international symbol for this visibility is runway visual range (RVR). The RVR is the maximum distance in the direction of takeoff and landing of aircraft at which the runway, runway lights, special lights, or markers marking the strip can be seen from the cockpit of an aircraft on the center line of the runway. Thus the RVR should correspond to the visibility used by the pilot. Author

N72-28662*# Litchford Systems, Northport, N.Y.
BROADCAST CONTROL OF AIR TRAFFIC
George B. Litchford Apr. 1972 162 p refs
(Contract NASw-2247)
(NASA-CR-127452) Avail: NTIS HC $10.25 CSCL 17G

The development of a system of broadcast control for improved flight safety and air traffic control is discussed. The system provides a balance of equality between improved cockpit guidance and control capability and ground control in order to provide the pilot with a greater degree of participation. The manner in which the system is operated and the equipment required for safe operation are examined. Author

N72-28663*# Boeing Co., Houston, Tex.
G AND C BOOST AND ABORT STUDY SUMMARY, EXHIBIT B
Howard D. Backman 30 Jun. 1972 28 p refs
(Contract NAS9-12183)
(NASA-CR-115714; Rept-5-2581-HOU-093) Avail: NTIS HC $3.50 CSCL 17G

A six degree of freedom simulation of rigid vehicles was developed to study space shuttle vehicle boost-abort guidance and control techniques. The simulation was described in detail as an all digital program and as a hybrid program. Only the digital simulation was implemented. The equations verified in the digital simulation were adapted for use in the hybrid simulation. Study results were obtained from four abort cases using the digital program. Author

N72-28664*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
CANDIDATE CONFIGURATION TRADE STUDY, STELLAR-INERTIAL MEASUREMENT SYSTEMS (SIMS) FOR AN EARTH OBSERVATION SATELLITE (EOS) Interim Technical Report
G. Ogletree, J. Coccoli, R. McKern, M. Smith, and R. White 15 Jun. 1972 424 p refs
(Contract NAS9-4065)
(NASA-CR-115709; E-2651; ITR-3) Avail: NTIS HC $23.50 CSCL 17G

The results of analytical and simulation studies of the stellar-inertial measurement system (SIMS) for an earth observation satellite are presented. Subsystem design analyses and sensor design trades are reported. Three candidate systems are considered: (1) structure-mounted gyros with structure-mounted star mapper, (2) structure-mounted gyros with gimbaled star tracker, and (3) gimbaled gyros with structure-mounted star mapper. The purpose of the study is to facilitate the decisions pertaining to gimbaled versus structure-mounted gyros and star sensors, and combinations of systems suitable for the EOS satellite. Author

N72-28665*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HIGH ENERGY ASTRONOMY OBSERVATORY STAR TRACKER SEARCH PROGRAM
William J. Weiler 6 Mar. 1972 46 p
(NASA-TM-X-64680) Avail: NTIS HC $4.50 CSCL 17G

The development of a control system to accommodate the scientific payload of the High Energy Astronomy Observatory (HEAO) is discussed. One of the critical elements of the system is the star tracker subsystem, which defines an accurate three-axis attitude reference. A digital computer program has been developed to evaluate the ability of a particular star tracker configuration to meet the requirements for attitude reference at various vehicle orientations. Used in conjuction with an adequate star catalog, the computer program provides information on availability of stars for each tracker and on the ability of the system to maintain three-axis attitude reference throughout a representative sequence of vehicle orientations. Author

N72-28666# Lockheed Missiles and Space Co., Palo Alto, Calif.
DETERMINATION OF ARTIFICIAL EARTH SATELLITE ORIENTATION BY MEANS OF MAGNETOMETER MEASUREMENTS
I. G. Khatskevich [1971] 11 p refs Transl. into ENGLISH from Kosmich. Issled. (Moscow), v. 10, no. 1, 1972 p 3-13
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The application of magnetometer measurements to determine the orientation of artificial earth satellites is discussed. The use of the zero approximation algorithm for increasing the reliability, accuracy, and universality relative to the character of the vehicle motion and the kind of information desired is described. Solutions of the mathematical representations of satellite orientation are presented. The orientation parameters are used to interpret the readings of the scientific devices on board, to analyze the satellite dynamics and to compute its structural characteristics. Author

N72-28667# Radio Technical Commission for Aeronautics, Washington, D.C. Special Committee 116-E.
MINIMUM OPERATIONAL CHARACTERISTICS FOR VERTICAL GUIDANCE EQUIPMENT USED IN AIRBORNE VOLUMETRIC NAVIGATION SYSTEMS
17 Mar. 1972 76 p refs
(DO-152) Avail: NTIS HC $6.00; RTCA Secretariat, Suite 655, 1717 H Street, N.W., Washington, D. C. 20006 $6.00

The concepts, philosophy, and development of minimum operational characteristics for airborne navigation systems are discussed. Emphasis is placed on the minimum operational characteristics for vertical guidance equipment used in volumetric navigation systems. The specifications for the equipment and the development of international standards are examined. An error analysis of various systems is included. P.N.F.

N72-28668*# Scientific Translation Service, Santa Barbara, Calif.
STABILITY CONDITIONS OF A GRAVITATIONAL STABILIZATION SYSTEM FOR SATELLITES WITH HYDRAULIC DAMPING
V. A. Sarychev Washington NASA Jul. 1972 13 p refs Transl. into ENGLISH from Trans. of the 2d Intern. Symp. of IFAC for Autom. Control in the Peaceful Use of Outer Space, "Upravleniye Kosmicheskimi Kosmicheskimi Apparatami i Korablyami" Moscow, Nauka Press, 1971 Conf. held in Vienna, Sep. 1967

(Contract NASw-2035)
(NASA-TT-F-14382) Avail: NTIS HC $3.00 CSCL 17G

The Routh method is used to analyze the stability of an orbiting satellite containing several gyroscopes. Asymptotic stability criteria are established. Author

N72-28669*# Scientific Translation Service, Santa Barbara, Calif.
A SYSTEM FOR CONTROLLING THE THREE DIMENSIONAL MOTION OF A SPACECRAFT DURING ITS ATMOSPHERE ENTRY
V. S. Vedrov, G. P. Vladychin, and I. A. Rubtsova Washington NASA Aug. 1972 12 p refs Transl. into ENGLISH from Proc. of 2d Intern. Symp. of IFAC for Autom. Control in the Peaceful Use of Outer Space, Vienna, Sep. 1967
(Contract NASw-2035)
(NASA-TT-F-14385) Avail: NTIS HC $3.00 CSCL 17G

The factors involved in the design of a system for controlling the three-dimensional motion of a spacecraft during atmospheric entry are discussed. It is stated that the optimization of the control system reduces to ensuring the maximum accuracy of reacting the final point, subject to a number of constraints imposed on the parameters of motion by the design features of the spacecraft such as limited maneuverability, strength, and heating. Mathematical models are included to support the theoretical considerations. Block diagrams of control systems to produce the desired accuracy under a variety of conditions are developed. P.N.F.

N72-28670# McDonnell-Douglas Co., St. Louis, Mo.
MICRO-CAS: A COLLISION AVOIDANCE SYSTEM FOR THE GENERAL AVIATION FLEET
Ronald M. Schutz 1971 15 p refs Presented at FAA 1971 Planning Rev. Conf., 26-29 Apr. 1971
Avail: NTIS HC $3.00

The trend of aircraft midair collisions clearly indicates the urgent need for a collision avoidance system (CAS). MICRO-CAS has been developed to provide collision avoidance to a large segment of the general aviation fleet. General aviation aircraft performance profiles were developed and used to determine protection levels attainable by various threat criteria. The degree of compatibility with the commercial carrier CAS was determined for each system synthesized. Range and altitude difference threat criteria were selected for MICRO-CAS and the system hardware requirements defined. Production cost estimates lead to the conclusion that MICRO-CAS, compatible with the commercial carriers' CAS, can be provided at a cost attractive to large numbers of general aviation aircraft owners. Author

N72-28671# Speas (R. Dixon) Associates, Manhasset, N.Y.
ANALYSIS OF DESIRABILITY OF ACHIEVING A FULLY COOPERATIVE AIR TRAFFIC CONTROL SYSTEM
Martin A. Warskow and Alex Kuprijanow Apr. 1971 36 p refs Presented at FAA 1971 Planning Rev. Conf.
Avail: NTIS HC $4.00

The development of an Intermittent Positive Control (IPC) system for air traffic control is discussed. With all aircraft equipped to conform to IPC, a cooperative traffic system results. The problems associated with achieving a cooperative system were studied. The investigation was concerned with the time required to achieve a cooperative system, the costs involved, and the possibilities of government cost-sharing for the required airborne equipment. P.N.F.

N72-28672# McDonnell-Douglas Co., St. Louis, Mo.
APPLICATION OF THE TIME/FREQUENCY COLLISION AVOIDANCE SYSTEM AS AN AID FOR LANDING AND GROUND OBSTACLE AVOIDANCE
Anatole Browde and F. D. Watson 1971 15 p
Avail: NTIS HC $3.00

The analysis and design effort that produced the threat evaluation and escape maneuver logic of the collision avoidance system (CAS) for the air-to-air situation has produced two new applications in the field of air safety: for the avoidance of ground obstacles, and for the provision of a minimum altitude protection zone around airports. It is determined that the airborne CAS, with only minor adaptations, can provide this additional protection. Installation of a CAS compatible time/frequency ground beacon on or near the obstacle or at an airport automatically provides inputs to the airborne CAS for threat evaluation and clear escape maneuver commands. As an option, this beacon can also be used for aircraft resynchronization. The addition of these functions in no way compromises the normal air-to-air CAS protection. The aircraft threat status relative to all CAS-equipped aircraft and relative to ground beacons is evaluated once every three seconds as before. Author

N72-28673# National Bureau of Standards, Washington, D.C. Signal Lighting Group.
DEVELOPMENT, TESTING, AND EVALUATION OF VISUAL LANDING AIDS Consolidated Progress Report, 1 Jan. - 31 Mar. 1972
1 May 1972 15 p refs Prepared for Naval Air Systems Command. Ship Installations Div. and Meteorol. Div. and for FAA
(NBS Proj. 2211509; NBS Proj. 2211510; NBS Proj. 2211511; NBS Proj. 2211514; NBS Proj. 2211680; NBS Proj. 2211681)
(NBS-10-837) Avail: NTIS HC $3.00

The development of visual aids for aircraft landing at airfields and on aircraft carriers is discussed. Instruments which have been produced for determining the proper operation of the systems are described. The specifications for the equipment and the arrangement of the lighting systems are reported. The importance of the systems for safe aircraft operations is emphasized. P.N.F.

N72-28674*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
GYRO AND ACCELEROMETER FAILURE DETECTION AND IDENTIFICATION IN REDUNDANT SENSOR SYSTEMS
James E. Potter and James C. Deckert May 1972 36 p
(Contract NAS9-4065; DSR Proj. 55-39100)
(NASA-CR-115749; E-2686) Avail: NTIS HC $4.00 CSCL 17G

Algorithms for failure detection and identification for redundant noncolinear arrays of single degree of freedom gyros and accelerometers are described. These algorithms are optimum in the sense that detection occurs as soon as it is no longer possible to account for the instrument outputs as the outputs of good instruments operating within their noise tolerances, and identification occurs as soon as it is true that only a particular instrument failure could account for the actual instrument outputs within the noise tolerance of good instruments. An estimation algorithm is described which minimizes the maximum possible estimation error magnitude for the given set of instrument outputs. Monte Carlo simulation results are presented for the application of the algorithms to an inertial reference unit consisting of six gyros and six accelerometers in two alternate configurations. Author

N72-28675# National Center for Atmospheric Research, Boulder, Colo.
THE MEASUREMENT OF AIR VELOCITY AND TEMPERATURE USING THE NCAR BUFFALO AIRCRAFT MEASURING SYSTEM
D. H. Lenschow Jun. 1972 44 p refs Sponsored by NSF
(NCAR-TN/EDD-74) Avail: NTIS HC $4.25

The methods used to measure air velocity and temperature from an aircraft and their application to the measuring system on the NCAR Buffalo aircraft are described. The main components of this system are: (1) an inertial navigation system that provides measurements of airplane acceleration, velocity, position, and angles of attitude; (2) an air sensing probe that provides measurements of angles of attack and sideslip, pitot-static pressure, and temperature; and (3) a second pitot-static tube

that provides measurements of both static pressure and pitot-static pressure; this pitot tube is free to align itself parallel to the airstream. The equations used to calculate the air velocity components from the inertial system and air sensing probe measurements are derived, use and limitations of the inertial navigation platform are discussed, methods used to calculate true airspeed and static temperature are presented, and errors in measurement and their effect on the calculated atmospheric variables are discussed. Author

N72-28676# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.

EARTH FLATTENING EFFECT ON POSITION FIXING BY TWENTY-FOUR HOUR SATELLITES [DER EINFLUSS DER ABPLATTUNG DER ERDE AUF DIE ORTUNG MITTELS 24H-SATELLITEN]

Otto Weber Jan. 1972 51 p refs In GERMAN; ENGLISH summary

(DLR-FB-72-20) Avail: NTIS HC $4.75; DFVLR, Porz: 13 DM

The effect of the flattening of the earth on aircraft position fixing in a 24-hour satellite navigation system is dealt with. The position determination of an aircraft is based on range measurements to the satellites and an altitude measurement, and can be separated into two problems: the intersection of the three surfaces of position and the transformation of geocentric into geographic coordinates. Plane and spherical approximations of the position surfaces are studied and examples for the error and the convergence of the intersection of the approximations are discussed. For flights over the North Atlantic a Soldner sphere is advantageous as an approximation of the earth ellipsoid. It is important for the transformation of the coordinates that the approximation and the earth ellipsoid are not only at a small distance from each other but have also nearly parallel normals. ESRO

N72-28677# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).

THE SIGNIFICANCE OF THE ELLIPSOIDAL FORM OF THE EARTH IN AIR NAVIGATION Ph.D. Thesis - Stuttgart Univ. [DIE BERUECKSICHTIGUNG DER ELLIPSOIDGESTALT DER ERDE IN DER FLUGNAVIGATION]

Lothar J. Kieffer 1971 120 p refs In GERMAN

(Ser-C/Diss-166) Avail: NTIS HC $8.00

Formulas are derived for evaluating the usual measurements in air navigation, which account for the ellipsoid flattening of the earth and inaccurate use of flight altitude. Formulas are given for calculation of geographic coordinates from grid coordinates that enable non-iterative evaluation. A presumably new approximative solution is given for calculating the distance between two distant points, as in Omega navigation. In addition formulas are derived enabling ellipsoidal magnitude to be modified for spherical calculation of geodetic lines. Flight over the ellipsoid of constant altitude using a gyrocompass is investigated. Inertial navigation exact formulas are derived for Doppler, and Tacan, which account for earth flattening and flight altitude. ESRO

N72-28678# Systems Technology, Inc., Hawthorne, Calif.

INVESTIGATION OF MEASURING SYSTEM REQUIREMENTS FOR LOW VISIBILITY LANDING Final Report, May 1970 - Sep. 1971

Lee Gregor Hofmann, Warren F. Clement, Dunstan Graham, Richard E. Blodgett, and Kishor V. Shah Wright-Patterson AFB, Ohio AFFDL Dec. 1971 67 p refs

(Contract F33615-70-C-1621; AF Proj. 404L)

(AD-739932; STI-TR-198-1; AFFDL-TR-71-151) Avail: NTIS CSCL 01/5

Two methods for determining measuring system requirements for instrument low visibility landing are described. These methods have been applied for analysis of two automatic landing systems using microwave scanning beam landing guidance. Results obtained from these analyses are presented and discussed in detail. Author (GRA)

N72-28679# Aeronautical Chart and Information Center, St. Louis, Mo. Technical Translation Section.

INVESTIGATION OF THE DYNAMIC OF GYROPLATFORMS WITH PENDULUM CORRECTION, INTENDED FOR STABILIZATION OF GRAVIMETRIC EQUIPMENT

V. K. Karpov, O. D. Oznobkin, and A. Ya. Shaidenko Feb. 1972 26 p refs Transl. into ENGLISH from the book "Apparatura i Metody Izmereniya Sily Tyazhesti na More" Moscow, Nauka Press, 1970 p 136-147

(AD-738074; ACIC-TC-1791) Avail: NTIS CSCL 08/5

The results from an investigation of the dynamics of gyroplatforms with pendulum correction are presented in this paper. They show that the correction channel has a considerable influence on stabilization errors. The analytical calculations were confirmed and made more precise by the mathematical analogue computation method and by experimental testing of the gyrostabilized platform 'Gorizont' on dynamic stands of low-frequency accelerations, and at sea during the expeditions in the Black Sea, organized by the Institute of Physics of the Earth, USSR Academy of Sciences. Author (GRA)

N72-28946* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.

MARINER MARS 1971 SCAN PLATFORM POINTING CALIBRATION

G. D. Pace, F. I. Jaivin, and R. A. Virzi *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 49-57 refs (For availability see N72-28941 19-34)

CSCL 17G

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N72-28680 National Lending Library for Science and Technology, Boston Spa (England).

ASPECTS OF CORROSION PREVENTION IN NUCLEAR REACTOR MATERIALS. 3: CORROSION BY LIQUID SODIUM

K. Furukawa and I. Nihei 28 Feb. 1972 21 p refs Transl. into ENGLISH from Boshogu Gijutsu (Japan), v. 18, no. 11/12, Dec. 1969, p 503-511

(NLL-CE-Trans-5828-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Studies of the compatibility of liquid sodium with fast nuclear reactor materials are reviewed. Most of the steels investigated are stainless steel, and particular reference is made to 18-8 stainless steel. The problem areas with respect to corrosion are identified as the fuel can and structural materials, steam generator materials, and nuclear fuels. N.E.N.

N72-28681*# Versar, Inc., Springfield, Va.

INSTABILITIES IN URANIUM PLASMA AND THE GAS-CORE NUCLEAR ROCKET ENGINE Final Report

D. A. Tidman May 1972 79 p refs

(Contract NASw-2231)

(NASA-CR-127480) Avail: NTIS HC $6.00 CSCL 18E

The nonlinear evolution of unstable sound waves in a uranium plasma has been calculated using a multiple time-scale asymptotic expansion scheme. The fluid equations used include the fission power density, radiation diffusion, and the effects of the changing degree of ionization of the uranium atoms. The nonlinear growth of unstable waves is shown to be limited by mode coupling to shorter wavelength waves which are damped by radiation diffusion. This mechanism limits the wave pressure fluctuations to values of order delta P/P approximates 0.00001

in the plasma of a typical gas-core nuclear rocket engine. The instability is thus not expected to present a control problem for this engine. Author

N72-28682*# Battelle Memorial Inst., Columbus, Ohio.
ADAVANCED RTG AND THERMOELECTRIC MATERIALS STUDY Final Report, Jan. - Oct. 1971
Philip E. Eggers Nov. 1971 86 p refs
(Contract NAS5-11394)
(NASA-CR-122431) Avail: NTIS HC $6.50 CSCL 18I

A comprehensive, generalized two-dimensional RTG analysis computer program was developed. This program is capable of analyzing any specified RTG design under a wide range of transient as well as steady-state operating conditions. The feasibility of a new concept for the design of segmented (or single-phase) thermoelectric couples was demonstrated. A SiGe-PbTe segmented couple involving pressure contacted junctions at the intermediate- and hot-junction temperatures was successfully encapsulated in a hermetically sealed bellows enclosure. This bellows-encapsulated couple was operated between a hot- and cold-junction temperature of 1200 K and 450 K, respectively, with a measured energy conversion efficiency of 7.6 + or - .5 per cent. An experimental study of selected sublimation barrier schemes revealed that a significant reduction in the sublimation rate of p-type PbTe could be achieved by using multiple layers of SiO2 fibers. A comparison of the barrier effectiveness is given for three different barrier designs. Author

N72-28683*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CRITICALITY EXPERIMENTS AND ANALYSIS OF MOLYBDENUM REFLECTED CYLINDRICAL URANYL FLUORIDE WATER SOLUTION REACTORS
Daniel Fieno, Thomas Fox, and Robert Mueller Washington Jul. 1972 28 p refs
(NASA-TN-D-6878; E-6812) Avail: NTIS HC $3.00 CSCL 18I

Clean criticality data were obtained from molybdenum-reflected cylindrical uranyl-fluoride-water solution reactors. Using ENDF/B molybdenum cross sections, a nine energy group two-dimensional transport calculation of a reflected reactor configuration predicted criticality to within 7 cents of the experimental value. For these reactors, it was necessary to compute the reflector resonance integral by a detailed transport calculation at the core-reflector interface volume in the energy region of the two dominant resonances of natural molybdenum. Author

N72-28684*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SHIELDING APPLICATION OF PERTURBATION THEORY TO DETERMINE CHANGES IN NEUTRON AND GAMMA DOSES DUE TO CHANGES IN SHIELD LAYERS
Daniel Fieno 1972 20 p refs Proposed for presentation at Natl. Topical Meeting on New Develop. in Reactor Phys. and Shielding, Kiamesha Lake, N. Y., 12-15 Sep. 1972; Sponsored by Am. Nucl. Soc.
(NASA-TM-X-68097; E-7070) Avail: NTIS HC $3.00 CSCL 18F

The perturbation theory for fixed sources was applied to radiation shielding problems to determine changes in neutron and gamma ray doses due to changes in various shield layers. For a given source and detector position the perturbation method enables dose derivatives due to all layer changes to be determined from one forward and one inhomogeneous adjoint calculation. The direct approach requires two forward calculations for the derivative due to a single layer change. Hence, the perturbation method for obtaining dose derivatives permits an appreciable savings in computation for a multilayered shield. For an illustrative problem, a comparison was made of the fractional change in the dose per unit change in the thickness of each shield layer as calculated by perturbation theory and by successive direct calculations; excellent agreement was obtained between the two methods. Author

N72-28685*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE DIMINIODE: A RESEARCH AND DEVELOPMENT TOOL FOR NUCLEAR THERMIONICS
James F. Morris Washington Aug. 1972 17 p refs
(NASA-TM-X-2586; E-6862) Avail: NTIS HC $3.00 CSCL 18J

Diminiodes are fixed-or variable-gap cesium diodes with plane miniature emitters and guarded collectors. In addition to smallness, their relative advantages are simplicity, precision, ease of fabrication, interchangeability of parts, cleanliness, full instrumentation, ruggedness, and economy. With diminiodes and computers used in thermionic performance mapping, a thorough electrode screening program becomes practical. Author

N72-28686# California Univ., Livermore. Lawrence Livermore Lab.
CONTROLLED THERMONUCLEAR RESEARCH Annual Report, Jul. 1970 - Jun. 1971
21 Sep. 1971 191 p refs
(Contract W-7405-eng-48)
(UCRL-50002-71) Avail: NTIS

This report describes the research and development work done at the Lawrence Livermore Laboratory and the Lawrence Berkeley Laboratory during fiscal year 1971 on the controlled thermonuclear reactor program. The major divisions of the program are the magnetic mirror program, the Astron program, the toroidal confinement program, and plasma and spectroscopic research. In addition, this report covers the extensive theoretical studies and mechanical and electronic engineering work done in these areas. The talks and publications of the CTR researchers are also listed. Author (NSA)

N72-28687# Brookhaven National Lab., Upton, N.Y.
DEVELOPMENT AND APPLICATION OF THE IBR PULSED REACTOR IN SCIENTIFIC RESEARCH
I. M. Frank 1971 87 p refs Transl. into ENGLISH from Russian report JINR-P3-5754 Sponsored by AEC
(BNL-TR-473; JINR-P3-5754) Avail: NTIS

The first 10 years of operation of the IBR reactor are reviewed. Basic achievements of research before and after the addition of the microtron injector are described, and the prospects for future achievements are discussed. NSA

N72-28688# Hanford Engineering Development Lab., Richland, Wash.
TENSILE PROPERTIES OF PROTOTYPIC FTR VESSEL WELDMENT MATERIALS (RM-15)
A. L. Ward Sep. 1971 12 p refs
(Contract AT(45-1)-2170)
(HEDL-TME-71-133) Avail: NTIS

The important features of the tensile behavior of the FTR vessel weldment materials are summarized. No string effect of directionality was exhibited by the weldment materials in short-term tensile tests. Strengths and ductilities were, however, slightly higher for the longitudinally oriented specimens than for the transverse case. Weld-deposited metal was both stronger and less ductile than the wrought base plate. Base plate properties were consistent with the industry-wide consensus for Type 304 stainless steel. Composite specimens generally exhibited tensile properties which were intermediate to those of the weld metal and base plate. All fractures occurred in weld metal. All specimens containing weld metal showed a reduced ability to work-harden compared to base plate material. All weld-containing specimens showed ductilities exceeding the minimum 10% residual end-of-life total elongation value specified for the FTR vessel and heavysection components. Additional work is required to determine the extent, if any, to which FTR operating conditions will degrade the as-fabricated weld material properties. NSA

N72-28689# Atomic Energy Commission, New York. Health and Safety Lab.
FALLOUT PROGRAM, APPENDIX Quarterly Summary

Report, 1 Dec. - 1 Mar. 1972
1 Apr. 1972 431 p refs
(HASL-249-App) Avail: NTIS

Tabulated data from the HASL fallout monitoring program are presented and include information on the Sr-89 and Sr-90 deposition at 125 world land sites, Sr-90 deposition at Atlantic Ocean weather stations, Sr-90 content in New York City milk and tapwater, and gamma radioactivity, radioisotope content, and stable lead content of surface air at world land sites. NSA

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics; 20 Meteorology; and 29 Space Radiation.

N72-28690 National Lending Library for Science and Technology, Boston Spa (England).
INVESTIGATION OF THE PRECONDITIONS OF THE PULSATION AND NOISE IN OPERATION OF MULTIJET INJECTION BURNERS
V. I. Maslov and A. V. Arseev May 1972 13 p refs Transl. into ENGLISH from Gaz. Prom. (Moscow), v. 8, 1971 p 26-30
(NLL-RTS-7187) Avail: Natl. Lending Library, Boston Spa, Engl.: £1.10 or 4 NLL photocopy coupons

The conditions needed to produce pulsation and noise during combustion and methods for eliminating them are investigated. Tests were carried out with natural gas burning test stands with low- and high-throughput multijet injection burners. The frequency, and amplitude of static pressure and burner noise intensity were measured. Results indicate burner design, number of burners used, and the type of mixer present in the burner may reduce pulsation and noise. E.H.W.

N72-28691 National Lending Library for Science and Technology, Boston Spa (England).
DISCHARGES FROM ELECTROSTATICALLY CHARGED NONCONDUCTIVE LAYERS ON METALS
E. Heidelberg 30 Mar. 1972 14 p refs Transl. into ENGLISH from PTB Mitt. (West Germany), v. 80, no. 6, Dec. 1970 p 440-444
(NLL-SMRE-Trans-5964-(8313.4)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Charged layers on grounded conductors show generally much higher surface charge densities (sigma) than in the absence of the conductor. With sigma smaller than 2.5 times 10 to the minus eight power C/sq cm only brush discharges are generated at the layers; with sigma greater than or equal to above value, Lichtenberg discharges arise. If only brush discharges are desired, the thickness of the layers should be kept as small as possible in order to avoid ignition of explosive mixtures by such discharges. On the other hand if Lichtenberg discharges are to be prevented, the thickness of the layers should at least be 8 mm. The energy of the Lichtenberg discharge is sufficiently great that the ignition of dust/air mixtures has to be considered. Author

N72-28692 Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
MEASUREMENT OF NOISE LEVELS, AND ANALYSES OF THE OCTAVE BAND AND ACCELERATION [MEDIDAS EM NIVEIS GLOBAIS E ANALISE EM FAIXAS DE OITAVAS DE BARULHO E ACELERACAO]
L. X. Nepomuceno 13 Jan. 1971 15 p In PORTUGUESE
(Rept-7101.477) Avail: Issuing Activity

The results are presented of the measurement and analysis of equipment noise and vibration for the Topema-Engenharia, Sao Bernado. An analysis of noise levels for residences in the vicinity is also included. The equipment and procedures used in the measurement and analysis are described. It is concluded that the high noise levels, and the vibrations of the equipment result in resonant vibrations in the nearby residences. To eliminate the source of the problem, it is recommended that the plant be redesigned to conform with international standards.
Transl. by F.O.S.

N72-28693# Electrotechnical Lab., Tokyo (Japan).
RESEARCHES ON SUPERCONDUCTING MAGNET
Susumu Shimamoto Dec. 1970 101 p refs In JAPANESE; ENGLISH summary
(RR-722) Avail: NTIS HC $7.25

A design technique for a superconducting magnet is reported from an electrical and magnetic point of view. Original methods of calculating the magnetic fields and electromagnetic forces of coils of various shapes are presented. It is shown that the configuration of a coil must be selected so as to match the critical points of both the superconductivity and strength of the material, satisfying the needs of the magnetic field. The maximum current density in a magnet, mechanism of nucleation and propagation of the normal region, temperature rise and energy dissipation are experimentally investigated in connection with magnets wound with non-gilt wire, copper-gilt wire, stranded wire, composite wire and hollow conductor wire. Author

N72-28694*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSMITTING AND REFLECTING DIFFUSERS Patent Application
Lloyd S. Keafer, Jr., Ernest E. Burcher, and Leonard P. Kopia, inventors (to NASA) Filed 30 Mar. 1972 9 p
(NASA-Case-LAR-10385-2; US-Patent-Appl-SN-239803) Avail: NTIS HC $3.00 CSCL 20F

An ultraviolet grade fused silica substrate is coated with vaporized fused silica. The coating thickness is controlled, one thickness causing ultraviolet light to diffuse and another causing ultraviolet light to reflect a near-Lambertian pattern. NASA

N72-28695# Toulouse Univ. (France).
STUDY OF THE POSSIBILITY OF UTILIZING THE CHARACTERISTIC VARIATIONS OF MAGNETIC MATERIALS AS TEMPERATURE FUNCTIONS Ph.D. Thesis [ETUDE ET POSSIBILITES D'UTILISATION DES VARIATIONS DES CARACTERISTIQUES DES MATERIAUX MAGNETIQUES EN FONCTION DE LA TEMPERATURE]
Robert Ferrier 28 Jun. 1972 188 p refs In FRENCH
Avail: NTIS HC $11.50

An experimental and theoretical examination was made to determine the possibility of using ferromagnetic and magnetic materials as temperature functions. Efforts were also made to develop measuring instruments, methods for determining the characteristics of toroidal ferromagnetic materials, and methods by which the temperature influence on magnetic materials may be measured. The performance characteristics of the measuring equipment are given. Transl. by E.H.W.

N72-28696*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ELECTRO-OPTICAL SCANNING APPARATUS Patent Application
Frederic C. Billingsley and John J. Volkoff, inventors (to NASA) Filed 16 Mar. 1972 19 p
(Contract NAS7-100)
(NASA-Case-NPO-11106-2; US-Patent-Appl-SN-235225) Avail: NTIS HC $3.00 CSCL 20F

An electro-optical system for scanning variable transmittance objects, such as film transparencies, is disclosed. The system includes a modulated scan-in illuminator and a scan-out photodetector device. Three general combinations of light intensity and scan rate, or dwell time, are used in the system: constant light intensity and dwell time, variable light intensity and

constant dwell time and constant maximum light intensity and variable dwell time. The selectively increased light intensity and dwell time enable the subject system to be used with objects having low degrees of transmissivity and for which a useable readout signal is difficult or impossible to obtain. NASA

N72-28697*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RELATIONS AMONG PURE-TONE SOUND STIMULI, NEURAL ACTIVITY, AND THE LOUDNESS SENSATION
Walton L. Howes Washington Jul. 1972 34 p refs
(NASA-TN-D-6889; E-6598) Avail: NTIS HC $3.00 CSCL 20A

Both the physiological and psychological responses to pure-tone sound stimuli are used to derive formulas which: (1) relate the loudness, loudness level, and sound-pressure level of pure tones; (2) apply continuously over most of the acoustic regime, including the loudness threshold; and (3) contain no undetermined coefficients. Some of the formulas are fundamental for calculating the loudness of any sound. Power-law formulas relating the pure-tone sound stimulus, neural activity, and loudness are derived from published data. Author

N72-28698*# College of William and Mary, Williamsburg, Va.
STABILITY OF CERTAIN PERIODIC SOLUTIONS OF A FORCED SYSTEM WITH HYSTERESIS
John H. Drew [1972] 9 p refs
(Grant NGL-47-006-055)
(NASA-CR-127462) Avail: NTIS HC $3.00 CSCL 20K

Many physical systems exhibit the phenomenon of nonlinear hysteresis when the amplitude of oscillation exceeds some small limit. It was shown that under certain conditions there are periodic motions of such a system with small forcing which are near the largest periodic motion of the corresponding unforced system. Conditions for the stability of these periodic motions are derived. Author

N72-28699*# California Univ., La Jolla. Dept. of Applied Physics and Information Sci.
THE APPLICATION OF SIGNAL DETECTION THEORY TO OPTICS Semiannual Status Report, 15 Oct. 1971 - 15 Mar. 1972
Carl W. Helstrom 15 Mar. 1972 49 p refs
(Grant NGL-05-009-079)
(NASA-CR-122449) Avail: NTIS HC $4.50 CSCL 20A

The role of measurements of noncommuting quantum observables is considered in the detection of signals and estimation of signal parameters by quantum receivers. The restoration of images focused on a photosensitive surface is discussed for data as numbers of photoelectrons ejected from various parts of the surface. The detection of an image formed on a photosensitive surface in the presence of background illumination for similar data is also considered. Author

N72-28700*# California Inst. of Tech., Pasadena.
RESEARCH IN NONLINEAR OPTICS Final Report, 1 Nov. 1967 - 1 Nov. 1970
Amnon Yariv 21 May 1972 20 p refs
(Grant NGR-05-002-107)
(NASA-CR-122448) Avail: NTIS HC $3.00 CSCL 20A

A theoretical investigation revealed that a steady state mode-locked solution appropriate to ultrashort pulses is induced by Kerr liquids. An experimental investigation using a Q-switched ruby laser passively mode-locked by the insertion of a Kerr liquid verified the theory. Pulses of about 10 to the -11th power sec were generated when the relaxation time of the liquid was temperature tuned to approximately 10 to the -11th power sec. Author

N72-28701# Grumman Aerospace Corp., Bethpage, N.Y. Materials and Structural Mechanics.
THE EFFECT OF SPEED ON WHEEL DRAG IN SOIL
Leslie L. Karafiath and Edward A. Nowatzki Jul. 1972 40 p refs
(RM-546) Avail: NTIS HC $4.00

An approach to the problem of soil-wheel interaction is presented that takes into account the effect of soil inertia forces on wheel performance in general and on wheel drag in particular. A method is described that couples particle path measurements obtained by flash X-ray techniques with the differential equations of plasticity to provide a model for the analysis of rigid wheels traveling at high speeds. Results of analyses using the model are in good agreement with available experimental data and show that drag load and wheel velocity are not monotonically related. Author

N72-28702# Joint Publications Research Service, Arlington, Va.
IONIZATION AND RECOMBINATION FRONTS IN AN ELECTROMAGNETIC FIELD
A. A. Barmin and A. G. Kulikovskiy 14 Jul. 1972 32 p refs Transl. into ENGLISH from Gidromekhan. (Moscow), v. 5, 1971 p 5-31
(JPRS-56500) Avail: NTIS HC $3.75

A survey is presented on the results of works devoted to the study of ionization and recombination fronts in a gas located in an electromagnetic field. Solutions of the simplest problems of flows containing such fronts are also considered. Author

N72-28703# National Research Council of Canada, Ottawa (Ontario).
PRIME IDEALS IN THE WITT RING
F. Lorenz and J. Leicht 1972 13 p refs Transl. into ENGLISH from Invent. Math. (West Germany), v. 10, no. 1 1970 p 82-88
(NRC-TT-1565) Avail: NTIS HC $3.00

The prime ideals in the Witt ring W sub K are considered for quadratic forms over a field K with the characteristic not = 2. For a real ground field, the minimal prime ideals of W sub K correspond to the orders of K. The exact relationship is formulated in Theorem 1. It was possible to determine the zero divisors of W sub K. How the Hasse principle for quadratic forms arises from the method of approach developed is explained. Author

N72-28704# Aeronautical Research Labs., Melbourne (Australia).
RADIAL STREAKS IN ELECTRON DIFFRACTION PATTERNS: OBSERVATION AND THEORY
P. A. Doyle, M. R. Kindermann, and J. F. Nankivell Sep. 1971 26 p refs
(ARL/Met-Note-77) Avail: NTIS HC $3.50

Electron diffraction patterns from cold-rolled aluminum and chromium specimens showed sharply defined radial streaks, rather than spots, on each Debye-Scherer ring. These patterns were obtained using only the two condenser lenses of a Siemens Elmiskop 1 and with the second condenser aperture removed. Under these conditions, it is shown that the spherical aberration of the second lens partially concentrates the beam in a narrow annulus on the rim of the illuminated area of the specimen. The resulting low lateral coherence in this annulus causes the streaks. By adapting two-beam dynamical theory, the decrease of streak length with increasing radius of the Debye-Scherer rings was explained. The absence of streaks for fully annealed specimens is predicted. Author

N72-28705# Nagoya Univ. (Japan). Inst. of Plasma Physics.
STOCHASTIC CHARACTER OF ELECTRON CYCLOTRON HEATING IN A NONUNIFORM MAGNETIC FIELD
T. Kawamura, C. Namba, and Y. Terashima Apr. 1972 12 p refs
(IPPJ-123) Avail: NTIS HC $3.00

The RF heating process of electrons in mirrors is thought to be stochastic, due to the nonadiabatic effect before electron energies reach some critical values. To attain higher energies, other causes of phase randomization should be considered. Author

N72-28706*# National Academy of Sciences-National Research Council, Washington, D.C. Physics Survey Committee.
PHYSICS IN PERSPECTIVE, VOLUME 1
1972 1080 p refs
(Contract NSR 09-012-090)
(NASA-CR-127703; LC-72-84752) Avail: NTIS HC $56.00 CSCL 20L

Progress in physics and its subfields is presented and the contribution of physics is related to progress in other scientific disciplines and the manner in which these have been utilized by our civilization. The future course of endeavor in the various subfields of physics and the extent to which these will require resources of manpower, facilities, and funding are discussed. The rational responses of the total research effort in physics to alternative funding levels are assayed. Author

N72-28707# Brookhaven National Lab., Upton, N.Y. Accelerator Dept.
HIGH-FIELD BENDING MAGNETS FOR ISABELLE
G. Parzen and K. Jellett 29 Feb. 1972 16 p refs
(BNL-16617; AADD-188; CRISP-72-13) Avail: NTIS

Circular bending magnets with a cosine current distribution, a 3 in. aperture, and going up to 40 kG are studied. A magnet is proposed that fulfills the suggested tolerances for ISABELLE. Topics discussed include approximating the cosine current distribution using a ribbon winding, choice of the iron shield parameters, dependence of the multipole terms on the field and the iron shield parameters, the sextupole correction windings, and tolerances for random errors in the coil locations.
Author (NSA)

N72-28708# Sandia Labs., Albuquerque, N.Mex.
PINHOLE DIAGNOSTICS FOR DIRECT MEASUREMENTS OF LOCALIZED ANGULAR DISTRIBUTIONS IN RELATIVISTIC HIGH CURRENT ELECTRON BEAMS
J. G. Kelly and L. P. Bradley Jan. 1972 52 p refs Sponsored by AEC
(SC-RR-720058) Avail: NTIS

The development of the pinhole diagnostic technique is described for the direct measurement of the electron angular distribution at a well defined position in a relativistic electron beam. Theoretical calculations are presented which were used to justify the accuracy of the technique, to correct the data, and to set limits on the regions of validity of the measurements. Some results of test on the Reba and the Nereus electron accelerators are presented. Author (NSA)

N72-28709# Rome Univ. (Italy). Inst. of Physics.
SOME PRECISE RESULTS IN STATISTICAL MECHANICS AND THEIR APPLICATION TO THE PHASE TRANSITION PHENOMENOLOGY [ALCUNI RISULTATI RIGOROSI IN MECCANICA STATISTICA E LORO APPLICAZIONI ALLA FENOMENOLOGIA DELLE TRANSIZIONI DI FASE]
G. Gallavotti 27 Nov. 1971 17 p refs In ITALIAN Presented at the SIF Congr., l'Aquila, Italy, 27 Oct. 1971
(Nota-Interna-347) Avail: NTIS HC $3.00

The application of statistical mechanics to the study of phase transitions of a set of particles of finite number is attempted. The analysis of the Ising model used for ferromagnetic and anti-ferromagnetic nonconductor materials suggests some hypotheses for new general definitions of some phase transition parameters in a finite system. ESRO

N72-28710# Northeastern Univ., Boston, Mass.
RESEARCH IN RELATIVITY THEORY Final Report, Sep. 1968 - Sep. 1971
Richard Arnowitt Wright-Patterson AFB, Ohio ARL Dec. 1971 39 p refs
(Contract F33615-69-C-1207; AF Proj. 7114)
(AD-739942; ARL-71-0323) Avail: NTIS CSCL 20/10

The final report discusses the research performed under the contract. The work was concerned with the following areas of general relativity and Yang-Mills theory: The connection between the canonical and diagrammatic methods of quantization of general relativity; The form of the quantum Bianchi identities and q-number terms in the Lagrangian of quantum general relativity; The coordinate transformation properties of angular momentum in classical general relativity; The origin of the fictitious scalar particles in quantum Yang-Mills theory. Author (GRA)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular, and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N72-28711*# Oak Ridge National Lab., Tenn. Neutron Physics Div.
DIFFERENTIAL CROSS SECTIONS AT FORWARD ANGLES FOR HYDROGEN AND HELIUM PARTICLES FROM 62 MeV PROTONS INCIDENT ON Ni-60
R. W. Peelle and F. E. Bertrand Jun. 1971 24 p refs
(NASA Order L-12186; Contract W-7405-eng-26)
(NASA-CR-127473; ORNL-4698) Avail: NTIS HC $3.25 CSCL 20H

Tabulated differential cross sections are presented for the production, at angles of 15, 20, 25, and 40 deg, of proton, deuteron, triton, helium-3, and alpha particles from Ni-60 bombarded by 62-MeV protons. Continuum cross sections are listed in about 1-MeV bins for energies above lower cutoffs which range from 4 to 15 MeV for the different types of exit particles. Only the integral cross section is known for a considerable energy range within each spectrum. The proton, deuteron, and alpha particle cross sections are the same in the continuum range region above the evaporation peak as those cross sections previously observed for Fe-54 and Fe-56, but the corresponding yield of tritons is higher from Ni-60 and Fe-56 than from Fe-54. Author

N72-28712*# Aerospace Corp., El Segundo, Calif. Space Physics Labs.
DIFFERENTIAL AND INTEGRAL CROSS SECTIONS FOR EXCITATION OF THE 2 1S STATE OF HELIUM BY ELECTRON IMPACT
James K. Rice (Sandia Labs., Albuquerque, N. Mex.), Donald G. Truhlar (Minn. Univ., Minneapolis), David C. Cartwright, and Sandor Trajmar (JPL) Aug. 1971 115 p refs Submitted for publication Sponsored in part by AEC and Minn. Univ. Dept. of Chem. Prepared in part by JPL
(Contracts NAS7-100; F04701-70-C-0059)
(NASA-CR-127549; AD-736448; SPL-2307; SC-RR-710474; CALT-767p4-84; TR-0172(9260-01)9; SAMSO-TR-72-11) Avail: NTIS HC $7.75 CSCL 20H

Experimental measurements of the differential scattering cross sections for excitation of helium by electron impact from its ground state to its 2 1S state are given at four incident electron energies in the range 26 to 55.5 eV for scattering angles between 10 and 70 deg and at 81.6 eV for scattering angles between 10 and 80 deg. These differential cross sections are normalized by using previously determined 2 1P cross sections and measured (2 1S)/2 1P) cross section ratios. The sections and cross section ratios are compared with results predicted by the Born approximation, the polarized Born approximation, and other first order approximations, in which direct excitation is calculated in the Born approximation and exchange scattering in various Ochkur-like approximations. The effect on the small angle scattering of several nonadiabatic dipole polarization potentials is examined. For the 34 to 81.6 eV energy range, it is shown that the inclusion of polarization is necessary for accurate predictions of the angle dependence of the 2 1S cross sections at small angles. The cross sections

resulting from the use of analytic self-consistent field wave functions for both the ground and excited states agree well with those obtained from more accurate, correlated wave functions.
Author

N72-28713# Electrotechnical Lab., Tokyo (Japan).
A MONTE CARLO SIMULATION FOR FAST ELECTRON AND PHOTON TRANSPORT IN THICK LAYERS OF MATTER
Haruo Sugiyama Feb. 1972 80 p refs In JAPANESE; partly in ENGLISH
(RR-724) Avail: NTIS HC $6.00

A Monte Carlo program was developed for the calculation of fast electron and photon penetration of matter. Multiple scattering of electron, straggling of electron energy loss by ionization and excitation, production of knock on electrons, and production of bremsstrahlung photons were considered. For photon penetration, photoelectric effect, Compton effect, pair production, and annihilation radiation from positron in rest or in flight were also considered. A general method was developed for transformation of random numbers and systematic sampling was adopted for the calculation of electron energy dissipation produced by incident photons. Author

N72-28714*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPARATUS FOR PRODUCING HIGH PURITY I-123 Patent Application
James W. Blue, inventor (to NASA) Filed 28 Jun. 1972 12 p
(NASA-Case-LEW-10518-2; US-Patent-Appl-SN-266927) Avail: NTIS HC $3.00 CSCL 20H

An improved tellurium target is bombarded with a beam from a cyclotron to produce Xe-123 which is carried away by flowing gas streams. Contaminants are first removed from the gas in a dry ice trap and subsequently the Xe-123 condenses in a liquid nitrogen trap where it decays to I-123. NASA

N72-28715*# College of William and Mary, Williamsburg, Va. Dept. of Physics.
CURVE CROSSING FOR LOW ENERGY ELASTIC SCATTERING OF He (PLUS) BY Ne
S. M. Bobbio, L. D. Doverspike, and R. L. Champion [1972] 20 p refs Sponsored in part by NSF
(Grant NGL-47-006-055)
(NASA-CR-127461) Avail: NTIS HC $3.00 CSCL 20H

The perturbation seen in the experimental differential elastic scattering cross section for the 40 eV He(+) + Ne system was attributed to a single crossing of two intermolecular potential energy curves. A new theoretical treatment of the curve crossing problem, that of Delos and Thorson, is employed to obtain the crossing probabilities and phases associated with the crossing. These are determined by utilizing ab initio potentials involved in the crossing and are further used in a partial wave calculation of the cross section, which is compared with our experiment. The origin of the oscillatory structure observed in the differential cross section is discussed in semiclassical terms by defining the problem in terms of two pseudo-deflection functions. A rainbow effect is shown to be related to a particular feature (a maximum rather than a minimum) of these deflection functions. Author

N72-28716*# Pittsburgh Univ., Pa. Space Research Coordination Center.
THE EXCITATION OF VACUUM ULTRAVIOLET RADIATION BY ELECTRON IMPACT ON CARBON MONOXIDE: SOME UNRESOLVED QUESTIONS NEAR THRESHOLD
W. C. Wells and E. C. Zipf Jun. 1972 7 p refs
(Grant NGL-39-011-030; Contract DA-31-124-ARO(D)-440)
(NASA-CR-127692) Avail: NTIS HC $3.00 CSCL 20H

The threshold behavior of the ultraviolet photon excitation function for electron impact on carbon monoxide was studied for the pseudo-resonance signal reported elsewhere. Time of flight spectrometer techniques were not able to confirm the resonant feature in excited CO states under electron impact. Author

N72-28717*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A CATALOGUE OF NORMALIZED INTENSITY FUNCTIONS AND POLARIZATION FROM A CLOUD OF PARTICLES WITH A SIZE DISTRIBUTION OF ALPHA TO THE MINUS 4TH POWER
P. D. Craven and G. A. Gary 7 Feb. 1972 164 p refs
(NASA-TM-X-64674) Avail: NTIS HC $10.25 CSCL 20H

The Mie theory of light scattering by spheres was used to calculate the scattered intensity functions resulting from single scattering in a polydispersed collection of spheres. The distribution used behaves according to the inverse fourth power law; graphs and tables for the angular dependence of the intensity and polarization for this law are given. The effects of the particle size range and the integration increment are investigated. Author

N72-28718*# Western Ontario Univ., London. Dept. of Physics.
ELASTIC AND INELASTIC SCATTERING OF POSITRONS IN GASES AND SOLIDS Annual Report, 1 Apr. 1971 - 31 Mar. 1972
J. William McGowan 31 Mar. 1972 113 p refs Sponsored by Natl. Res. Council
(Grant NGR-52-029-006)
(NASA-CR-122504) Avail: NTIS HC $7.75 CSCL 20H

Three apparatuses were designed and built: The first, which is now operative, was designed to study the details of positron thermalization in solids and the subsequent emission of the low energy positrons from moderating foils; The second apparatus now under test is a positron bottle similar in design to an electron trap. It was built to store positrons at a fixed energy and to look at the number of stored positrons (storage time) as a function of a scattering gas in the vacuum chamber. The third apparatus is a crossed beam apparatus where positron-, alkali scattering will be studied. Much of the apparatus is now under test with electrons. Author

N72-28719*# Space Sciences, Inc., Natick, Mass.
DOPPLER SHIFT SYSTEM Patent Application
Sol Aisenberg, inventor (to NASA) Filed 28 Jun. 1972 19 p
(Contract NASw-1703)
(NASA-Case-HQN-10740-1; US-Patent-Appl-SN-266943) Avail: NTIS HC $3.00 CSCL 20H

A system for measuring velocities of radiating particles based on the Doppler shift is disclosed. Light from the particles is directed through a narrow band optical filter to a Fabry-Perot interferometer initially tuned to a selected center line corresponding to zero particle Doppler shift. The movable mirror of the interferometer is made to sweep about the center line by the output of a modulation oscillator. The fringe pattern output is projected onto a pin hole through which light is directed to a photomultiplier. The output of the photomultiplier is supplied to a phase-sensitive detector which is supplied with the oscillator output as a reference signal. The detector output is gain-controlled and is combined with the oscillator output to adjust the interferometer's movable mirror to attain the line center. NASA

N72-28720*# Techtran Corp., Glen Burnie, Md.
QUANTUM MECHANICAL EXPLANATION OF ACTIVATION
F. London NASA Jul. 1972 12 p refs Transl. into ENGLISH from Z. Elektrochem. (Weinheim), V. 35, no. 9, 1929 p 552-555
(Contract NASw-2037)
(NASA-TT-F-14393) Avail: NTIS HC $3.00 CSCL 20J

Results of studies on homopolar valence forces are reported. Univalent atoms are considered exclusively in computing forces between atoms on the basis of ideal situation where the atoms form rigid systems. Author

N72-28721*# Scientific Translation Service, Santa Barbara, Calif.
ADSORPTION OF HYDROGEN ATOMS AND MOLECULES

ON PLATINUM

J. C. P. Mignolet Washington NASA Jul. 1972 19 p refs Transl. into ENGLISH from J. Chim. Phys. (Paris), v. 54, 1957 p 19-26
(Contract NASw-2035)
(NASA-TT-F-14362) Avail: NTIS HC $3.00 CSCL 20H

The adsorption of hydrogen on platinum was studied at -190C and at 20C mainly by the measurement of surface potentials. The slightly concentrated films are essentially atomic. In keeping with a recently proposed rule, they present a negative surface potential. In highly concentrated films, hydrogen is fixed mainly in the form of molecules. Molecular adsorption bears a positive sign. Molecular adsorption is surprisingly stable, the differential heat of adsorption being approximately 15 KCal/mole. The preceding results, obtained with platinum deposits prepared by evaporation, are in complete disagreement with those of Suhramann and Sachtler, as well as those of Oatley obtained with platinum sheets. It is very probable that these latter results do pertain to PtH films. Author

N72-28722# Maryland Univ., College Park. Center for Theoretical Physics.

SOME TOPICS IN WEAK INTERACTIONS

Riazuddin Jun. 1972 158 p refs Lectures given at Center for Theoret. Phys., College Park, Md., Fall Semester 1971
(Grant NSF GU-2061)
(TR-72-091) Avail: NTIS HC $10.00

The topics discussed include: (1) the long-life kaon decay yields muon(+) muon(-) puzzle, (2) second-class currents, and (3) high energy neutrino reactions, including scaling, current algebra sum rules, and light cone structure of current commutators. Author

N72-28723*# National Aeronautics and Space Administration, Washington, D.C.

QUANTUM MECHANICS AS RELATIVISTIC STATISTICS (THE CASE OF INTERACTING PARTICLES)

Yu. A. Rylov Jul. 1972 30 p refs Transl. into ENGLISH from "Kvantovaya Mekhanika kak Relyativistikaya Statistika (Sluchay Dvukh Vzaimodeystvuyushikh Chastits) Chasty 2", Inst. of Space Res., Acad. of Sci., Moscow, report Pr-86, 1971 31 p
(NASA-TT-F-14372; Pr-86) Avail: NTIS HC $3.50 CSCL 20H

It is shown that nonrelativistic quantum mechanics of two particles interacting with an external electromagnetic field and with each other can be considered as the statistics of two-dimensional surfaces representing the state of the system consisting of two nondeterministic particles in eight-dimensional space. This space is the direct product of the space-times for each particle. Author

N72-28724*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

INVESTIGATION OF LOW-Z COSTER-KRONIG TRANSITIONS BY MEANS OF AUGER AND PHOTOELECTRON SPECTROSCOPY

Lo I. Yin, Tung Tsang (Howard Univ.), and Isidore Adler Jun. 1972 15 p refs Submitted for publication
(NASA-TM-X-65956; X-641-72-207) Avail: NTIS HC $3.00 CSCL 20H

Experimental intensity ratios of Auger transitions for Co, Ni, Cu, and Zn as well as the relative L sub 2 and L sub 3 level widths of Cu and Zn, derived from their photoelectron spectra, are presented. Evidence is presented that a great deal of vacancy reorganization took place following photoionization and prior to Auger emission. These reorganizations are assumed to be due to Coster-Kronig transitions f sub 23. These results are compared with theoretical calculations and agree with predicted discontinuity at Z = 30 where f sub 23 transitions become energetically impossible. Author

N72-28725# Nagoya Univ. (Japan). Inst. of Plasma Physics.

SOME ENGINEERING ASPECTS OF JIPP STELLARATOR

Kenro Miyamoto, Akihiro Mohri, Setsuya Fujiwaka, Nobuyuki Inoue, Masami Fukiwara, Kiyoshi Atsu, and Ryohei Itatai Apr. 1972 23 p refs
(IPPJ-T-8) Avail: NTIS HC $3.25

The JIPP-I stellarator was designed for the study of plasma confinement, which depends on the parameters of the magnetic configuration, such as the rotational transform angle, shear, magnetic well depth, as well as the plasma parameters. Some engineering aspects of JIPP-I stellarator are described. Author

N72-28726# Technische Hochschule Munchen (West Germany). Fakultaet fuer Bauwesen.

STUDY OF VAN DER WAALS FORCES BETWEEN MACROSCOPIC BODIES AT DISTANCES FROM 100 A TO 1600 A Ph.D. Thesis [STUDIUM DER VAN DER WAALS KRAEFTE ZWISCHEN MAKROSKOPISCHEN KOERPERN BEI ABSTAENDEN VON 100 A BIS 1600 A]

Heinz Splittgerber Nov. 1971 74 p refs In GERMAN
Avail: NTIS HC $5.75

Bending measurements on a thin plate fastened to the surface of one of two macroscopic solid bodies are used to determine the van der Waal forces between these bodies. Measurements are described for quartz glass under consideration of the moisture effect. It is found that a transfer from delayed to unrestricted van der Waal forces exists continuously in the 150 A to 600 A region. Transl. by G.G.

N72-28727*# Greyrad Corp., Princeton, N.J.

SPECTROCOPIC MEASUREMENTS OF WATER VAPOR PLASMAS AT HIGH RESOLUTION: THE OPTICAL TRANSITION PROBABILITIES FOR OH (A 2 SIGMA - X 2 PI)

Lothar Klein Washington NASA Aug. 1972 151 p refs
(Contract NAS3-13424)
(NASA-CR-2069) Avail: NTIS HC $3.00 CSCL 20H

Emission and absorption spectra of water vapor plasmas generated in a wall-stabilized arc at atmospheric pressure and 4 current, and at 0.03 atm and 15 to 50 A, were measured at high spatial and spectral resolution. The gas temperature was determined from the shape of Doppler-broadened rotational lines of OH. The observed nonequilibrium population distributions over the energy levels of atoms are interpreted in terms of a theoretical state model for diffusion-controlled arc plasmas. Excellent correlation is achieved between measured and predicted occupation of hydrogen energy levels. It is shown that the population distribution over the nonpredissociating rotational-vibrational levels of the A 2 Sigma state of OH is close to an equilibrium distribution at the gas temperature, although the total density of this state is much higher than its equilibrium density. The reduced intensities of the rotational lines originating in these levels yielded Boltzmann plots that were strictly linear. Author

N72-28728*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A VERSATILE MOSSBAUER SPECTROMETER AND ITS APPLICATIONS IN VIBRATION MEASUREMENT

Jag J. Singh and Lona M. Howser Washington Aug. 1972 41 p refs
(NASA-TN-D-6819; L-8318) Avail: NTIS HC $3.00 CSCL 14B

A Fe-57 Mossbauer spectrometer, equally efficient in transmission and reflection geometries, is described. The radiation detector consists of a 1.524- by 5.08 by 5.08-cm rectangular NaI(Tl) crystal with a hole 1.524 cm in diameter. The front and back faces of the crystal are covered with beryllium windows 0.0127 cm thick and 3.81 cm in diameter. The energy of the radiation accepted for counting ranges from 6.3 keV conversion X-rays to the 14.4 keV reemitted gamma rays. The spectrometer was used to measure various types of low frequency (<10 Hz) and low amplitude (<0.254 mm) periodic motion of steel specimens. Author

N72-28729# Institute of Nuclear Physics, Krakow (Poland).
INFLUENCE OF HAMMETT'S COEFFICIENTS ON THE DISTRIBUTION RATIO OF LANTHANIDE AND TRANSPLUTONIDE ION-PAIRS WITH ALIQUAT-336
Ignacy Stronski and Elzbieta Nahlik Nov. 1971 16 p refs
(INP-781) Avail: AEC Depository Libraries

The dependence of the distribution ratio D on the Hammett coefficients by liquid-liquid extraction of the salts of europium, americium, and curium was investigated using tricaprylmethylam monium nitrate as extracting reagent. An inverse relationship of the values of log D and delta was found.
Author (NSA)

N72-28730# Central Lab. for Radiological Protection, Warsaw (Poland).
NATURAL GAMMA BACKGROUND RADIATION MEASUREMENTS IN POLAND BY MEANS OF THE SCINTILLATION AIRPLANE MONITOR
J. Pensko, M. Biernacka, B. Gwiazdowski, E. Niedziolka, and K. Mamont-Ciesla 1971 34 p ref In POLISH; ENGLISH summary
(CLOR-87/D) Avail: AEC Depository Libraries

The method and results of measuring natural gamma background radiation by means of a scintillation airplane monitor are described. The accuracy of the measurements in static conditions is of the order of + or - 15%. The exposure dose-rate was determined for the earth level in a net of points at 2 km distance of each other. The dose-rate values obtained are within 6 to 16 micron R/h. The vicinity of granite gneisses and granites are most probably responsible for the increase of the level of natural gamma background.
Author (NSA)

N72-28731# CIT Compagnie Industrielle des Telecommunications, Bruyeres-le-Chatel (France). Centre Pierre Herreng.
THERMOELECTRIC CONVERSION PROCESS: APPLICATION TO RADIOSOTOPE SOURCES
Alais and Stahl 20 Apr. 1971 20 p refs In FRENCH Presented at Intern Conf. on Chem. Sci., Paris, 20 Apr. 1971
(FRNC-Conf-13; Conf-710444-6; Rept-280.71.347) Avail: AEC Depository Libraries

The efficiency of a thermoelectric generator depends on two factors: the conversion yield of the thermoelectric material and the thermal losses due to imperfections in the insulator. The various semiconducting elements used in these generators are classified according to their working temperature; for a given type of material the thermal losses include a term which is independent of the thickness of the insulator. Examples are presented of the GISETTE V, a 15w underwater generator, possessing a 70,000 Ci strontium titanate hot source and GIPSIE, a generator used with pacemakers. The radioisotopes commonly used in thermoelectric generators are listed.
NSA

N72-28732# McElroy (Ralph) Co., Austin, Tex.
EMISSION OF RELATIVISTIC CHARGED PARTICLES IN MAGNETIC AND ELECTRIC UNDULATORS
N. A. Korkhmazyan and C. C. Elbakyan 1971 7 p refs Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR, Ser. Fiz. (Armenia SSR), v. 6, no. 1, 1971 p 7-11 Sponsored by AEC Prepared for Univ. of Calif. Lawrence Livermore Lab., Livermore
(UCRL-Trans-10586) Avail: NTIS

The problem of fast charged particles in motion in homogeneous static electric and magnetic fields is analyzed. It is shown that a fragmentarily homogeneous field of intensity E sub 0 is equivalent to a sinusoidal with amplitude (2/pi)E sub 0 cos(pi/2) (p-1)/(p+1), where p = (b/a), a is the width of the magnetic (electric) poles, and b is the distance between the neighboring poles. Also treated is the effect of the deflection of the trajectory of the particle from the axis of the undulator in emission.
Author (NSA)

N72-28733# Yeshiva Univ., New York.
NUCLEAR PHYSICS AND ASTROPHYSICS Final Progress Report, 1 Jun. 1968 - 31 Aug. 1971
31 Aug. 1971 37 p refs
(Contract AT(11-1)-3583)
(TID-25946) Avail: NTIS

Research in nuclear physics and nuclear astrophysics at Yeshiva University in the period 1 June 1968 to 31 August 1971 is summarized.
NSA

N72-28734# Rome Univ. (Italy). Inst. of Physics.
ELECTROPRODUCTION OF PIONS AT LOW ENERGIES
Edoardo Amaldi 9 Jul. 1971 69 p refs Presented at the Seminar on Electromagnetic Interactions, Trieste, Italy, 21-26 Jun. 1971
(Nota-Interna-326) Avail: NTIS HC $5.50

Experimental and theoretical knowledge concerning electroproduction of positive and neutral pions at low energy, in particular near thresholds, is summarized along with their kinematical nature. The general expression, derived from the cross section with the assumption of a single photon exchange, is given, and the main lines of the various theoretical approaches are described. Coincidence experiments and results of their analysis are discussed.
ESRO

N72-28735# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COMPUTER CODES AVAILABLE FOR ANALYSIS OF DIRECT NUCLEAR REACTIONS
Yong S. Park and Heber D. Jones Mar. 1972 39 p refs
(RDT/E Proj. 1B0-61102-B-12B)
(AD-739921; BRL-MR-2164) Avail: NTIS CSCL 20/8

The report is a documentation of computer codes available at BRL for the analysis of direct nuclear reactions. It has been generated as a detailed supplement to the existing instruction manuals, which, where available, provide only very general information on code applications. In the report, emphasis is placed on additional options which have been incorporated into the original programs to enhance their applicability to the types of experiments performed at this laboratory. Sample input and output for local users are presented to clarify the utilization of the codes in situations of interest to experimenters at BRL.
Author (GRA)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N72-28736 National Lending Library for Science and Technology, Boston Spa (England).
ASYMPTOTIC SOLUTION IN THE PROBLEM OF ANOMALOUS RESISTIVITY OF A COLLISIONLESS PLASMA
G. E. Vekshtein, D. D. Ryutov, and R. Z. Sagdeev Sep. 1971 21 p refs Transl. into ENGLISH from Russian rept. IyaF-97-70 Nucl. Phys. Inst., Novosibirsk, USSR, 1970
(NLL-CTO-771-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Time variations of the charged particle distribution functions in a homogeneous plasma in an external electric field are discussed and it is shown that as t becomes infinite the distribution functions have a similarity variation, all velocities increasing linearly with time. It is found that, when the current is parallel to the external magnetic field, the directed velocity of the electrons varies in essentially the same manner as in free acceleration. If the current is perpendicular to the external magnetic field, there is no runaway, and the ratio of the directed and thermal velocities of the electrons becomes much less than unity.
Author

N72-28737 National Lending Library for Science and Technology, Boston Spa (England).
EXPERIMENTS IN THE TOKAMAK-6 DEVICE

N. D. Vinogradova, V. S. Vlasenkov, E. P. Gorbunov, V. M. Leonov, V. S. Mukhovatov, M. P. Petrov, and L. D. Sinitsyna Aug. 1971 15 p refs Transl. into ENGLISH of I. V. Kurchatov Inst. of Atomic Energy, Moscow, report CN-28/F-8 Presented at 4th conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 1971
(NLL-CTO-784-(9091.9F); CN-28/F-8) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Results are presented of initial experiments carried out in Tokamak 6. The device has the following dimensions: major radius of torus = 70 cm and radius of discharge vessel cross-section = 25 cm. The experiments were carried out with an axial magnetic field of up to 7.5 KOe, a plasma current of 15-50 kA, and an initial hydrogen pressure of 1 to 5 times 0.0001 torr. Results are given concerning the equilibrium conditions of the plasma column. It is shown that, in macroscopically stable discharge regimes the transverse and longitudinal ion temperatures are almost equal. A range of discharge regimes with high electrical conductivity and a characteristics instability bas been found; the transverse plasma energy undergoes a sudden increase at the time when this instability develops. Author

N72-28738 National Lending Library for Science and Technology, Boston Spa (England).
ELECTRICAL CONDUCTIVITY AND OHMIC HEATING OF PLASMA IN A STRONG MAGNETIC FIELD
P. Ya. Burchenko, E. D. Volkov, V. A. Rudakov, V. L. Sizonenko, and K. N. Stepanov 8 Dec. 1971 15 p refs Transl. into ENGLISH of Ukr. SSR Acad. of Sci., Inst. of Appl. Phys., Kharkov, report CN-28/H-9 Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 1971
(NLL-CTO-779-(9091.9F); CN-28/H-9) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Results are given for the electrical conductivity of a plasma in a strong magnetic field. Author

N72-28739 National Lending Library for Science and Technology, Boston Spa (England).
INVESTIGATION OF MACROSCOPIC INSTABILITIES OF A PLASMA COLUMN IN TOKAMAK DEVICES
S. V. Mirnov and I. B. Semenov Aug. 1971 10 p refs Transl. into ENGLISH of I. V. Kurchatov Inst. of At. Energy, Moscow conf. paper CN-28/F-5 Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 1971
(NLL-CTO-783-(9091.9F); CN-28/F-5) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

An investigation was carried out in T-3 and T-4 to determine the instabilities of a plasma column that occurs when q(a) = H sub z a/H sub phi R takes the integral values 3 and 2. For these conditions, at the column boundary a resonance-type helical stability developes, with m/n = q(a). The reduction of q below 2 was achieved by a programmed increase of the axial current during the discharge. If q does not take integral values near the boundary, the plasma column is more stable than if resonances are present. In addition to the instability related to increased discharge current, the plasma column instabilities which occur when the plasma density is increased to the critical value, and the instabilities arising when the plasma column is widened under the influence of transverse magnetic fields are examined. The structure of the perturbations was investigated by correlation analysis of the spatial fluctuations of the discharge current magnetic field. An X-ray method was used to study the mechanism of development of the instability. The results support the hypothesis that the instability develops from the periphery to the center of the plasma. It was found that the development of the disruptive instability is preceded by heating of the plasma and a narrowing of the region in which the current flows.
Author

N72-28740 National Lending Library for Science and Technology, Boston Spa (England).
INVESTIGATION OF PLASMA DECAY IN THE PR-6 ADIABATIC TRAP
Yu. T. Baiborodov, M. S. Ioffe, B. I. Kanaev, R. I. Sobolev, and E. E. Yushmanov Aug. 1971 21 p refs Transl. into ENGLISH of I. V. Kurchatov Inst. of At. Energy, Moscow conf. paper CN-28/G-7 Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 1971
(NLL-CTO-778-(9091.9F); CN-28/G-7) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The injection technique for the PR-6 adiabatic trap was modified by redesigning the plasma source and using a radial RF electric field to heat the ions. Confinement of the plasma was studied by measuring the rate of free decay of the plasma after injection ceased. Characteristics of the decaying plasma and their variation with time were examined: density (measured by means of a radiointerferometer); integrated flux of charge exchange neutrals; differential fluxes of charge exchange neutrals in different energy ranges from 200 eV upwards; plasma potential; ion and electron fluxes through the magnetic mirrors. The experimental results point to the occurrence of a high frequency instability during the second stage of decay. Author

N72-28741 National Lending Library for Science and Technology, Boston Spa (England).
EXPERIMENTAL AND THEORETICAL INVESTIGATION OF A PINCH DISCHARGE OF PLASMA FOCUS TYPE
N. V. Filippov, V. I. Agafonov, I. F. Belyaeva, V. V. Vikhrev, V. A. Gribkov, L. G. Golubchikov, V. F. Dyachenko, V. S. Imshennik, V. D. Ivanov, O. N. Krokhin et al Aug. 1971 33 p refs Transl. into ENGLISH of I. V. Kurchatov Inst. of At. Energy, Moscow conf. paper CN-28/D-6 Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 1971
(NLL-CTO-775-(9091.9F); CN-28/D-6) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

Theoretical and experimental investigations are presented on the development of the high current gas discharge (plasma focus type) accompanying the noncylindrical compression of the z pinch. In addition to the usual operating regimes, variants involving a complex gas density profile are tried. Considerable attention is paid to the influence of impurities, in the form of heavy atoms, on the progress of the discharge. The principles underlying the increase in neutron yield as a function of capacitor bank energy and working gas composition are determined. Machine calculations were made of the motion of the plasma sheath when there are wide variations in the initial conditions and the electrical characteristics of the discharge circuit. Author

N72-28742 National Lending Library for Science and Technology, Boston Spa (England).
CONTAINMENT OF AN OHMIC-HEATING PLASMA IN THE URAGAN HIGH-SHEAR STELLARATOR
V. N. Vishnevetskii, E. D. Volkov, A. G. Dikii, and V. M. Zalkind 17 May 1972 10 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 15, no. 5, 1971 p 751-756
(NLL-CTO-808-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl: 1 NLL photocopy coupon

Studies of the containment of an ohmic-heating plasma in a high shear stellarator are described. It is shown that the containment time relative to the Bohm value increases with increasing shear and rotational transform. For a shear of about 0.085 the relative containment time is about 30 tau sub B (tau sub B is the Bohm containment time). The experimental data are in satisfactory agreement with theory. Author

N72-28743*# Aeronautical Research Associates of Princeton, Inc., N.J.
RESEARCH ON PLASMA TURBULENCE INVOLVING BINARY PARTICLE COLLISIONS AND COLLECTIVE EFFECTS Final Report
Guido Sandri May 1972 50 p refs
(Contract NASw-2352)
(NASA-CR-127479) Avail: NTIS HC $4.50 CSCL 20I

Plasmas in which binary collisions are important are studied

by means of nonadiabatic methods. Two- and three-body correlations are calculated to determine the one-particle distribution for the ionization model. The general dispersion analysis is summarized, and examples of the ionization model and of the static fluctuations are discussed. Author

N72-28744*# Stanford Univ., Calif. Inst. for Plasma Research.
A STUDY OF OPTICAL SCATTERING METHODS IN LABORATORY PLASMA DIAGNOSIS
Claude R. Phipps, Jr. Mar. 1972 126 p refs
(Grant NGL-05-020-277)
(NASA-CR-127454; SU-IPR-462) Avail: NTIS CSCL 20I

Electron velocity distributions are deduced along axes parallel and perpendicular to the magnetic field in a pulsed, linear Penning discharge in hydrogen by means of a laser Thomson scattering experiment. Results obtained are numerical averages of many individual measurements made at specific space-time points in the plasma evolution. Because of the high resolution in k-space and the relatively low maximum electron density 2 x 10 to the 13th power/cu cm, special techniques were required to obtain measurable scattering signals. These techniques are discussed and experimental results are presented. Author

N72-28745# Electrotechnical Lab., Tokyo (Japan).
NUMERICAL SOLUTION OF DISPERSION EQUATION FOR A BI-MAXWELLIAN PLASMA
Masafumi Kito Dec. 1971 128 p refs In JAPANESE; ENGLISH summary
(RR-723) Avail: NTIS HC $8.50

On the basis of Vlasov's and Maxwell's equations, an initial value problem of a plasma in the presence of an external magnetic field was solved by a method of Fourier and Laplace transforms. For the bi-Maxwellian plasma, roots of the dispersion equation were numerically calculated. Newton's method was applied. Author

N72-28746# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Plasmadynamik.
INVESTIGATION OF A LOW POWER PLASMA ACCELERATOR
Lothar Liebing and Felix Seidel 1972 30 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-31) Avail: NTIS HC $3.50; DFVLR Porz-Wahn: 10.30 DM

A new plasma accelerator is described which was designed with respect to attitude control requirements of satellites. This accelerator is operated in a quasi-stationary mode at relatively low discharge current. The propellant is fed into the discharge by means of ablation which provides a low density, nearly collisionless plasma. Measurements of various properties of the discharge plasma and of different heat fluxes are described. An energy balance is presented. Author

N72-28747*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HALL CURRENT EFFECTS IN THE LEWIS MAGNETOHYDRODYNAMIC GENERATOR
Lester D. Nichols and Ronald J. Sovie Washington Jul. 1972 27 p refs
(NASA-TM-X-2606; E-6924) Avail: NTIS HC $3.00 CSCL 20I

Data obtained in a magnetohydrodynamic generator are compared with theoretical values calculated by using the Dzung theory. The generator was operated with cesium-seeded argon as the working fluid. The gas temperature varied from 1800 to 2100 K, the gas pressure from 19 to 22 N/sq cm, the Mach number from 0.3 to 0.5, and the magnetic field strength from 0.2 to 1.6 T. The analysis indicates that there is incomplete seed vaporization and that Hall current shorting paths (through the working fluid to ground at both the entrance and exit of the channel) limit generator performance. Author

N72-28748*# Scientific Translation Service, Santa Barbara, Calif.
CALCULATION PROCEDURE, OPTIMIZATION AND COST FACTORS OF NORMAL-CONDUCTIVE, CRYOGENIC AND SUPERCONDUCTING MAGNETS FOR EXPERIMENTAL PLASMA PHYSICS
B. Oswald Washington NASA Jul. 1972 100 p refs Transl. into ENGLISH of Max-Planck-Inst. fuer Plasmaphys. Rept. IPP-4/96, Nov. 1971 p 1-76
(Contract NASw-2035)
(NASA-TT-F-14340; IPP-4/96) Avail: NTIS HC $7.00 CSCL 20I

A number of calculations and optimizing methods are presented for normally conductive, cryogenic, and superconducting magnets in linear (cylindrical) and toroidal devices. Relevant cost factors and functions are given as a basis for the comparison of costs of various magnet systems. Author

N72-28749# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ION CYCLOTRON WAVE GENERATION IN A TWO ION PLASMA
H. Toyama and K. Matsuura May 1972 27 p refs
(IPPJ-124) Avail: NTIS HC $3.50

Exact calculation of dispersion relation of cold plasma shows different behavior from that predicted by usual approximation theory neglecting electron inertia in the low density limit. Experimental observations of optimum coupling of ion cyclotron waves in the two-ion plasma of the QP machine are presented as a function of plasma density. Experimental data agrees qualitatively with the dispersion relation of a homogeneous cold plasma column with a sharp boundary. The dependence of optimum loading on the diameter of plasma column disagrees with the theoretical prediction. Author

N72-28750# Nagoya Univ. (Japan). Inst. of Plasma Physics.
HYBRID RESONANCE DUE TO TWO-ION SPECIES IN A PLASMA
Hiroshi Toyama May 1972 14 p refs
(IPPJ-125) Avail: NTIS HC $3.00

Hybrid resonance due to two-ion species, H(+) and H2(+), was observed in a fully-ionized plasma for the density range (2 x 10 to the 11th power to 1.6 x 10 to the 12th power/cu cm) using Stix type induction coil. The resonance condition, which was found experimentally, was in good agreement with theoretical predictions. Author

N72-28751# Nagoya Univ. (Japan). Inst. of Plasma Physics.
INHOMOGENEOUS EFFECT ON COIL TO PLASMA COUPLING IN ION CYCLOTRON WAVE
Hiroshi Toyama and Kiyokata Matsuura Jun. 1972 28 p refs
(IPPJ-126) Avail: NTIS HC $3.50

Dependence of absorbed RF power on the diameter of plasma column was examined experimentally in the density region of 10 to the 11th power cu/cm to 2 x 10 to the 12th power cu/cm, using a QP machine. When the absorbed RF power P is proportional to a sup gamma (a is the diameter of plasma column), calculation on uniform plasma column shows gamma = 4. However, experimental the value of gamma was less than 2. It is shown that effect of inhomogeneous density profile makes gamma lower than 2 and that density profile is important to heat a plasma efficiently. Author

N72-28752# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NONLINEAR MODULATION OF PLASMA WAVES
Masashi Kako Jun. 1972 39 p refs
(IPPJ-128) Avail: NTIS HC $4.00

Nonlinear modulation of waves in a cold plasma is investigated with a modification of a perturbation method. In particular, it is shown that a modulated electron-cyclotron wave is influenced by a slow motion of the plasma and that there is a critical wave number for the onset of modulational instability. The critical wave number is found to be independent of the

direction of propagation. A lower hybrid wave, which propagates perpendicular to a uniform magnetic field, is shown to be stable against the wave modulation and in the limit of small wave number the modulated wave is an oscillatory solution of the Korteweg-de Vries equation obtained by Gardner and Morikawa.
Author

N72-28753# Paris Univ., Orsay (France).
RESEARCH AND DEVELOPMENT INVOLVED IN THE CONCEPTION OF A DEVICE FOR DETERMINING THE INSTANTANEOUS ELECTRON DISTRIBUTION FUNCTION IN THE PLASMA OF A POSITIVE COLUMN, WHICH IS EITHER CALM OR PERTURBED BY A PERIODIC SIGNAL Ph.D. Thesis
Pierre Rabache 1971 100 p refs In FRENCH
(FRNC-TH-160) Avail: AEC Depository Libraries

Two methods were developed for recording the energy distribution function in a positive column plasma. The first method utilizes an analog differentiator and is suitable for measurements on quiescent plasmas. The second method utilizes a digital differentiator and is suitable for measurements on plasmas periodically perturbed with frequencies up to 50 kHz. The second method was applied to a quiescent plasma and the two methods were subsequently compared. It was found that, in a low current positive He discharge column, the EDF is Maxwellian when the electron energy is less than the first excitation threshold, and that above this value, a deficiency in fast electrons occurs. The properties of a positive column perturbed by a strong discharge current modulation were studied. A modification in the mean magnitudes characterizing the plasma was observed.
NSA

N72-28754*# Paris Univ. (France). Faculte des Sciences
STUDY OF THE BEHAVIOR OF LANTHANUM IN ELECTRIC ARC PLASMAS Ph.D. Thesis
Jelisaveta Antic 1971 115 p refs In FRENCH
(FRHC-TH-158) Avail: AEC Depository Libraries

Lanthanum was used to study the spectroscopy of the evolution of the thermodynamic conditions of a plasma. In this way, fundamental information relating to the problem of the determination of rare earth traces in various substances, particularly other rare earths, was obtained, and the basic ideas necessary to interpret the behavior of rare earths in cold plasma were established. The conditions under which the La emission takes place are examined empirically: chemical nature of the additives, effect of the current intensity, chemical form of the La sample, nature of the gaseous atmosphere of the arc, and the type of anode used.
NSA

N72-28755# Institut fuer Plasmaphysik G.m.b.H., Garching (West Germany).
EFFECT OF PLASMA FLOW ON TOROIDAL CONFINEMENT
B. J. Green Jan. 1972 49 p refs
(IPP-6/101) Avail: AEC Depository Libraries

An attempt is made to review recent developments in the study of plasma flow and its effect on toroidal plasma confinement. The topic is presently the object of active research, so that this summary will serve rather as a progress report of development. The different approaches to the problem are classified and discussed in such a way as to indicate the status of results that have been achieved and to highlight the outstanding problems.
Authors (NSA)

N72-28756# Oak Ridge National Lab., Tenn.
NUMERICAL CALCULATIONS OF OFF-RESONANCE HEATING
J. C. Sprott Apr. 1972 22 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3731) Avail: NTIS

The off-resonance heating observed in hot-electron plasmas is explained in terms of harmonic resonances, appropriately modified to include relativistic and Doppler effects. A theoretical expression for the heating rate is proposed and is found to agree with the results of a computer simulation over a range of parameters. The theoretical heating rate is evaluated numerically for several special cases including a uniform magnetic field, a mirror field with a 2:1 mirror ratio, and a large-aspect-ratio bumpy torus. The enhanced axial loss observed experimentally with heating below the cyclotron frequency is explained by absorption at harmonics of the electron bounce frequency.
Author (NSA)

N72-28757# European Space Research Inst., Frascati (Italy).
NONLINEAR THEORY OF THE ExB ELECTRON DRIFT INSTABILITY IN HIGH BETA PLASMAS WITH TI APPROXIMATELY EQUAL TO TE
Andre Rogister 1972 42 p refs Submitted for publication
Avail: NTIS HC $4.25

A nonlinear theory of the cyclotron electron drift instability for approximately equal electron and ion temperatures is developed. The theory is based on the wave kinetic equation for weakly turbulent collisionless plasmas in a uniform magnetic field. It is found that nonlinear electron cyclotron resonances stabilize short wavelength, but destabilize long wavelength modes. The total wave energy however is stabilized by this mechanism. In a two-dimensional model wave-wave scattering processes can transfer energy from the unstable small k-region of the spectrum towards large k's where nonlinear electron damping dominates. In a one-dimensional model, the energy could not be scattered off the small k-range at the proper rate and at a turbulence level compatible with experimental results for the relevant matrix elements.
ESRO

N72-28758# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
SELECTED PAPERS PRESENTED AT THE SECOND ARC SYMPOSIUM OF THE 23D ANNUAL GASEOUS ELECTRONICS CONFERENCE Final Report
Allen M. Hunter, II and Charles C. Miller Dec. 1971 80 p refs Conf. held at Hartford, Conn., 20-21 Oct. 1971
(AF Proj. 7063)
(AD-739939; ARL-71-0302) Avail: NTIS CSCL 20/9

Contents: Thermodynamic and transport properties; Steady state and RF Arcs; Effects of electron temperature variations; Flow effects; Magnetic field effects.
GRA

N72-28759# New York Univ., N.Y. Dept. of Electrical Engineering.
SELF-CONSISTENT THEORY OF WAVES IN FLUCTUATING PLASMA
N. Marcuvitz Sep. 1971 9 p
(Contract N00014-67-A-0467-0018)
(AD-737654; Memo-M-10) Avail: NTIS CSCL 20/9

At the microscopic level, the plasma field is described by stochastic (operator) variables determined by the non-linear Maxwell-Klimontovitch equations. Via a perturbation-theoretic analysis familiar from general scattering theory, one can derive from these stochastic microscopic equations the kinetic equations descriptive of the macroscopic plasma field. In a many particle system - the author considers specifically a system of charged particles with long range electromagnetic interactions such as in a plasma - one has to describe self-consistently both the particle dynamics and the field dynamics.
Author (GRA)

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N72-28760 National Lending Library for Science and Technology, Boston Spa (England).
INTERNAL CRYSTALLINE SEGREGATION IN NICKEL ALLOYS, ALLOYED WITH NIOBIUM
N. N. Burova and S. R. Maslenkov 29 Feb. 1972 7 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Metal. (Moscow), no. 1, 1971 p 91-93 In ENGLISH and RUSSIAN
(NLL-Trans-746-1127) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The quantitative characteristics of internal liquid separation were determined in binary (Ni-Nb), ternary (Ni-Cr-Nb), and complex Ni-base alloys such as Cr-77Ni-Ti-Al, in which part of the Ti was replaced by Nb, and Cr-50Ni-Mo-Nb-W-Al an alloy with a high Nb content, whose hardening during aging is caused by the precipitation of Ni3Nb. It was discovered that Nb has a marked susceptibility to liquid separation. K.P.D.

N72-28761* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THIN FILM TEMPERATURE SENSOR AND METHOD OF MAKING SAME Patent
Joseph Maserjian and John R. Gatewood, inventors (to NASA) Issued 11 Jul. 1972 6 p Filed 13 Jul. 1971 Sponsored by NASA
(NASA-Case-NPO-11775; US-Patent-3,676,754;
US-Patent-Appl-SN-162230; US-Patent-Class-317-230;
US-Patent-Class-29-570; US-Patent-Class-317-261) Avail: US Patent Office CSCL 20L

A thin film temperature sensor for fast response is disclosed. The sensor is formed on a foil of tantalum using a self-supporting oxide of the foil as a substrate and vapor deposition techniques to deposit a temperature-sensitive capacitor. A dielectric material is sandwiched between layers of aluminum which serve as capacitor electrodes. An insulation layer of SiO2 is deposited before the outer electrode, except over the active region of the capacitor, and a passivation film of Al2O3 is deposited over the entire device except an area where a lead is soldered to the outer electrode. The entire assembly is coated with Parylene C. Official Gazette of the U.S. Patent Office

N72-28762* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SCREENED CIRCUIT CAPACITORS Patent
Donald R. Ulrich, inventor (to NASA) Issued 14 Mar. 1972 6 p Filed 5 Feb. 1969
(NASA-Case-LAR-10294-1; US-Patent-3,649,353;
US-Patent-Appl-SN-796685; US-Patent-Class-117-212;
US-Patent-Class-29-25.42; US-Patent-Class-106-39;
US-Patent-Class-106-46; US-Patent-Class-117-217) Avail: US Patent Office CSCL 20L

Data are presented that cover: (1) material compositions suitable for high dielectric thick films which can be deposited and processed in place, (2) recrystallization techniques that yield high dielectric films, and (3) methods of making screenable dielectric thick films. Official Gazette of the U.S. Patent Office

N72-28763*# Stanford Univ., Calif. Solid-State Electronics Lab.
FUNDAMENTAL STUDIES OF THE METALLURGICAL, ELECTRICAL, AND OPTICAL PROPERTIES OF GALLIUM PHOSPHIDE AND GALLIUM PHOSPHIDE ALLOYS Technical Summary Report, 1 Feb. 1969 - 31 Jan. 1972
Apr. 1972 15 p refs
(Grant NGL-05-020-043)
(NASA-CR-127458; SU-SEL-72-012) Avail: NTIS HC $3.00 CSCL 20B

Abstracts, bibliographic data, oral presentations, and published papers on (1) Diffusion of Sulfur in Gallium Phosphide and Gallium Arsenide, and (2) Properties of Gallium Phosphide Schottky Barrier Rectifiers for Use at High Temperature are presented. E.H.W.

N72-28764# Saarland Univ., Saarbrucken (West Germany).
STUDIES OF THE EFFECT OF NOBLE METAL SINGLE CRYSTAL DIMENSIONS ON OPTICAL MATERIAL CONSTANTS IN THE REGION OF SPHERICAL PLASMA RESONANCE Ph.D. Thesis [UNTERSUCHUNGEN ZUM EINFLUSS DER GROESSE VON EDELMETALL-MIKROKRISTALLITEN AUF DIE OPTISCHEN MATERIAL-KONSTANTEN IM BEREICH DER KUGEL-PLASMA-RESONANZ]
Uwe Kreibig 1971 167 p refs In GERMAN
Avail: NTIS HC $10.50

The effects of crystalline grain size on optical constants of colloidal gold-and silver-crystals were studied by measuring optical extinction and energy losses of fast electrons in their lattices. Crystalline grains down to 16A were measured. Comparison of measured and theoretical results showed that selective colloid extinction bands formed in the lattices through spherical plasma oscillations of the excited conduction electrons. Comparison of silver constants calculated under consideration of the path length effect with experimentally determined dielectric constants underlined the effect of grain size on optical constants of colloidal crystals. Transl. by G.G.

N72-28765# Saarland Univ., Saarbrucken (West Germany).
SUPERCONDUCTIVITY AND BAND FERROMAGNETISM IN THE TWO BAND MODEL Ph.D. Thesis [SUPRALEIT-UNG UND BANDFERROMAGNETISMUS IM ZWEIBAND-MODELL]
Dierk Rainer 1970 142 p refs In GERMAN
Avail: NTIS HC $4.25

A two band model is formulated that considers a particle-particle band and a particle-hole band for coexistence of ferromagnetic and superconducting properties in homogeneous materials. Approximation methods are used to determine the interaction effect functions, the matrix elements of the Coulomb exchange and the electron-phonon exchange effects between the electronic Eigenphases of the crystal. Pair fluctuations and spin fluctuations are coupled by an equation system for effective exchange effect constants. It is concluded that the superconducting band and the ferromagnetic band in a metal have to be weakly coupled in order to eliminate the destroying effects of spin fluctuations on superconductivity, and that the ferromagnetic Curie point has to be at low temperatures to check the pair-breaking effect in the fully magnetized ferromagnetic polarized band. Transl. by G.G.

N72-28766*# Translation Consultants, Ltd., Arlington, Va.
PRELIMINARY RESULTS REGARDING DEVELOPMENT OF SUPERCONDUCTING RIBBONS OF Nb3Sn
G. Pasotti, M. V. Ricci, N. Sacchetti, G. Sacerdoti, and M. Spandoni Washington NASA Jul. 1972 14 p refs Transl. into ENGLISH of CNEN, Frascati, Italy, Rept. LNF-70/18, 5 May 1970
(Contract NASw-2038)
(NASA-TT-F-14327; LNF-70/18) Avail: NTIS HC $3.00 CSCL 20L

Preliminary results of the development of superconducting ribbons of Nb3Sn, obtained by the diffusion of tin in the niobium, are discussed. The production, and measuring apparatus and techniques are described. Characteristics of the superconducting ribbons were determined with respect to temperature.
Author

N72-28767*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPUTER PROGRAMS FOR CALCULATION OF THERMODYNAMIC FUNCTIONS OF MIXING IN CRYSTALLINE SOLUTIONS
P. A. Comella and S. K. Saxena (VPI, Va.) Jul. 1972 51 p refs
(NASA-TM-X-65965; X-641-72-249) Avail: NTIS HC $4.75 CSCL 20L

The computer programs Beta, GEGIM, REGSOL1, REGSOL2, Matrix, and Quasi are presented. The programs are useful in

various calculations for the thermodynamic functions of mixing and the activity-composition relations in rock forming minerals.
F.O.S.

N72-28768# Technische Hochschule Munchen (West Germany). Fakultaet fuer Allgemeine Wissenschaften.
DIRECT MECHANICAL MEASUREMENT OF PIVOT-STRENGTH IN TYPE 2 SUPERCONDUCTORS Ph.D. Thesis [DIREKTE MECHANISCHE MESSUNG VON PINNING-KRAEFTEN IN TYP 2-SUPRALEITERN]
Gunnar Eggendorfer 19 Nov. 1971 50 p refs In GERMAN
Avail: NTIS HC $4.50

The effects of lattice defects and inhomogeneities on conduction properties of niobium crystals were studied by measuring torque moment limitations of the quanta flux into crystal lattice holes. A constant torque indicated the pinning cutoff since pinning force per volume unit is directly proportional to torque moment limitations. Transl. by G.G.

N72-28769# Technische Hochschule Hannover (West Germany). Facultat fuer Mathematik und Naturwissenschaften.
POLAR AND LATTICE DYNAMIC CHARACTERISITCS OF FERROELECTRIC POTASSIUM IODATE CRYSTALS Ph.D. Thesis [POLARE UND GITTERDYNAMISCHE EIGENSCHAFTEN VON FERROELEKTRISCHEM KJO3]
Ekhard Salje 19 Jul. 1971 57 p refs In GERMAN
Avail: NTIS HC $5.00

Ferroelectric, piezoelectric, electro-optical, and lattice dynamic properties of monoclinic potassium iodate are studied; the four observed phase transformation temperatures are -163 C, 105 C, 72.5 C and 212 C, respectively. Approximated bond energies show that ferroelectric characteristics are determined by monoclinic deformation of the iodate octahedron and the strong displaceability of the positive potassium ion. Transl. by G.G.

N72-28770# Electrotechnical Lab., Tokyo (Japan).
FLUCTUATIONS IN THE RESISTIVE TRANSITION IN SUPERCONDUCTING ALUMINUM FILMS
Koji Kajimura Nov. 1971 75 p refs
(RR-720) Avail: NTIS HC $5.75

Excess electrical conductivity due to thermodynamic fluctuation of the superconducting order parameter in thin aluminum films has been measured as a function of temperature, electric and magnetic fields, and purity of specimens. Contribution from the Maki-Thompson (MT) term to the excess conductivity was found to be large when the normal state sheet resistance of films was small. Author

N72-28771# Tennessee Univ., Knoxville.
MEASUREMENT SYSTEM FOR SUPERCONDUCTING RF RESONANT CAVITIES
P. Z. Peebles, Jr., C. M. Jones, R. King, and J. Judish 1972 13 p refs Presented at Region 3 Conf. on Scanning the Spectrum, Knoxville, Tenn., 10 Apr. 1972 Prepared in cooperation with Oak Ridge Natl. Lab., Tenn. Sponsored by AEC
(Conf-720401-4) Avail: NTIS

Special considerations must be given to measurement techniques when making measurements on superconducting RF resonant cavities. A system using an oscillator loop is described that is especially designed to overcome most problems associated with narrow bandwidth, high field levels and instabilities. Author (NSA)

N72-28772# California Univ., Los Angeles.
A TECHNIQUE FOR MEASURING NONSQUARE PULSED HIGH VOLTAGES TO 0.25 PERCENT ACCURACY Final Report
James W. Holm-Hennedy and Tony P. C. Ku 16 Feb. 1972 32 p
(Grant NSF GK-5274)
(PB-206686) Avail: NTIS HC $3.00 CSCL 20L

An accurate technique for measuring a wide range of pulsed voltages and currents of large magnitude (kilovolts and amps) and short duration at either low or high repetition rates is described. The technique is accurate for both square and nonsquare pulses. The technique is particularly useful for measuring the J-E characteristics (current density electric field) of semiconductors at high electric fields. The unknown voltages are matched on a CRO to voltage-divided zener diode limited pulses which are accuracy known. The sample circuit and reference pulse circuits are given. Author (GRA)

N72-28773# Defence Research Information Centre, Orpington (England).
INVESTIGATION OF THE SPUTTERING OF MONOCRYSTALS OF InSb, GaAs AND GaSb
L. N. Nevsorna and V. Yurasova Mar. 1972 12 p refs Transl. into ENGLISH from Moscow Univ. Vestn. (Moscow), no. 4, 1971 p 370-375
(AD-739986; DRIC-Trans-2684; BR-30053) Avail: NTIS CSCL 20/12

The spatial distribution of substances sputtered from monocrystals of compounds A(III)B(V) and also its relation to the time of sputtering, the energy and mass of bombarding ions and the angle of incidence of the ions on the target are investigated. The ion bombardment is accomplished with ions of Ne(-), Kr(-) and Xe(-) with energies from 0.5 to 20 keV. Author (GRA)

N72-28774# Maryland Univ., College Park. Engineering Materials Group.
THERMAL ACTIVATION STRAIN RATE ANALYSIS (TASRA) FOR POLYCRYSTALLINE METALS
Ronald W. Armstrong Mar. 1972 29 p refs
(Contract N00014-67-A-0239; NR Proj. 031-739)
(AD-739674; EMG-81; TR-5) Avail: NTIS CSCL 20/12

The thermal activation strain rate analysis, in the formalism of Seeger, is connected with the Hall-Petch stress-grain size analysis for polycrystals to describe the plastic strength of single crystals and polycrystals at various temperatures and strain rates and for various microstructures. Particular attention is given to the Hall-Petch stress concentration factor, and to the constitutive relation predicting that the logarithm of the Hall-Petch friction stress, is linear with temperature. These considerations bear on the purpose of this research contract because the Hall-Petch parameters play a key role in predicting the ductile-brittle transition behavior of certain body-centerd cubic and hexagonal close-packed metals. Author (GRA)

N72-28775# Illinois Univ., Urbana. Coordinated Science Lab.
EXPERIMENTAL STUDIES OF ATOMIC BEHAVIOR AT CRYSTAL SURFACES
Gert Ehrlich Mar. 1972 78 p refs
(Contract DAAB07-67-C-0199)
(AD-739734; R-553; UILU-ENG-72-2214) Avail: NTIS CSCL 20/2

Recent experimental results on the behavior of crystal surfaces on the atomic level are reviewed, together with the appropriate experimental methods. Special emphasis is placed on the following topics: (1) Surface energetics, (2) Atomic arrangement and vibrations, (3) Observation on individual atoms. Author (GRA)

N72-28776# Army Materials and Mechanics Research Center, Watertown, Mass. Ceramics Div.
DISLOCATION BEHAVIOR IN SAPPHIRE SINGLE CRYSTALS
Jaroslav L. Caslavsky and Charles P. Gazzara Dec. 1971 21 p refs
(DA Proj. 1T0-61102-B-32A)
(AD-739904; AMMRC-TR-71-55) Avail: NTIS CSCL 20/2

The investigation of large melt-grown sapphire crystals by X-ray transmission topography revealed an arrangement of basal dislocations generally described as tangles. Since present theories could not fully account for the tangle formation in sapphire, a mechanism involving dislocation reactions is suggested as a feasible explanation. Helices were generated by annealing thin sapphire plates close to the melting temperature. The axes of the helices were found to be parallel to the Burgers vectors, i.e., parallel to the -(2)(-1)(-1)(0)= directions with no preference for a particular direction. Each helix observed was of an approximately regular shape, or possessed relatively constant pitch and diameter. The average diameter of the helices was about 50 micrometers. Mechanisms for the formation of cusp dislocations are discussed. Author (GRA)

N72-28777# Army Materials and Mechanics Research Center, Watertown, Mass.
THE STUDY OF BASAL DISLOCATIONS IN SAPPHIRE
Jaroslav L. Caslavsky, Charles P. Gazzara, and Raymond M. Middleton Dec. 1971 14 p refs
(DA Proj. 1T0-61102-B-32-A)
(AD-739902; AMMRC-TR-71-53) Avail: NTIS CSCL 20/2

An analysis of the Burgers vectors of dislocations in sapphire, revealed by X-ray transmission topography, confirmed the existence of the Burgers vectors parallel to the < (2)(-1)(0)> directions. Experimental evidence for the magnitude of the Burgers vectors is given. Numerous dislocation reactions of the type < (2)(-1)(-1)(0)> + < (-1)(2)(-1)(0)> + < (-1)(-1)(2)(0)> = 0 are verified. Author (GRA)

N72-28778# Army Materials and Mechanics Research Center, Watertown, Mass.
THE OBSERVATION OF HELICAL DISLOCATIONS IN SAPPHIRE
Jaroslav L. Caslavsky and Charles P. Gazzara Dec. 1971 10 p refs
(DA Proj. 1T0-61102-B-32-A)
(AD-739903; AMMRC-TR-71-54) Avail: NTIS CSCL 20/2

Helical dislocations have been found in sapphire for the first time. Lang X-ray diffraction topographs, including a stereotopograph revealing such helical dislocations are shown. The Burgers vectors, in all cases, have been found to be parallel to the -(2)(-1)(-1)(0)= directions as well as with the axes of the helical dislocations. Author (GRA)

N72-28779# Stanford Univ., Calif. Microwave Lab.
MICROWAVE ACOUSTIC AND BULK DEVICE TECHNIQUE STUDIES Interim Technical Report, 1 May - 31 Oct. 1971
Marvin Chodorow and H. J. Shaw Griffiss AFB, N. Y. RADC Feb. 1972 26 p refs
(Contract F30602-71-C-0125; AF Proj. 5573)
(AD-739898; ML-2007; RADC-TR-71-319; ITR-3) Avail: NTIS CSCL 20/12

The objectives of the contract are to advance new theory and device techniques for the generation and processing of microwave signals using elastic, electromagnetic, and carrier space charge waves in solid media. The work under the contract is presently divided into three projects as follows: acoustic parametric interactions; wide bandwidth dispersive delay lines; and bulk and surface acoustic wave amplifiers. Author (GRA)

N72-28780# Autonetics, Anaheim, Calif.
EPITAXIAL FILM GROWTH OF BUBBLE DOMAIN MATERIALS Semiannual Report, 1 May - 31 Oct. 1971
D. M. Heinz and P. J. Besser Wright-Patterson AFB, Ohio AFML Mar. 1972 66 p refs
(Contract F33615-71-C-105516; AF Proj. 7371)
(AD-739877; C70-1431.12/501; AFML-TR-72-7) Avail: NTIS CSCL 20/2

The program's objective is to improve the compatibility between substrates and films of epitaxially grown magnetic bubble domain materials. The initial effort has been concerned with gallium-substituted erbium iron garnet films prepared by chemical vapor deposition. The introductory section of this report contains a discussion of the means by which the requirements for the existence of cylindrical magnetic domains may be met in epitaxial films. The experimental section deals with film and substrate matching, garnet substrate crystal composition determinations, improvements in film deposition control and heat treatment of films. Techniques for characterizing magnetic bubble domain films are reviewed and properties of gallium-substituted erbium iron garnet films are discussed. Author (GRA)

N72-28781# Army Materials and Mechanics Research Center, Watertown, Mass. Ceramics Div.
GROWTH OF LARGE MONOCRYSTALS OF Al2O3 BY A GRADIENT FURNACE TECHNIQUE
Dennis J. Viechnicki and Frederick Schmid Dec. 1971 10 p refs
(DA Proj. 1T0-62105-A-330)
(AD-739905; AMMRC-TR-71-56) Avail: NTIS CSCL 20/2

A new technique, a gradient furnace technique, has been developed for the high-temperature growth of large monocrystals of Al2O3 from the melt. The technique employs a vacuum graphite resistance furnace with a helium-cooled tungsten/molybdenum heat exchanger protruding into it. Author (GRA)

N72-28782# Army Materials and Mechanics Research Center, Watertown, Mass. Ceramics Div.
A COMPUTED X-RAY DIFFRACTION POWDER PATTERN AND LATTICE CONSTANT OF B4C
Charles P. Gazzara Dec. 1971 15 p refs
(DA Proj. 1T0-61102-B-32-A)
(AD-739901; AMMRC-TR-71-52) Avail: NTIS CSCL 20/2

A table of X-ray diffraction powder data has been prepared for B4C. X-ray diffracted powder intensities have been computed from the single-crystal structure factors, and the interplanar spacings (d) have been calculated from a lattice constant determination of B4C for d = 0.77 A. A tabulation of Bragg angles (2 theta) using CuK(alpha 1), CuK(alpha 2), CuK(alpha), and CuK(beta) X-radiation, for the listed d spacings is also included. Author (GRA)

N72-28783# California Univ., Los Angeles. Dept. of Electrical Science and Engineering
NARROW GAP SEMICONDUCTORS Pb(1-x)Sn(x)Te AND Pb(1-y)Sn(y)Se Final Report, 1 Jun. 1970 - 1 Sep. 1971
Tien F. Tao and C. C. Wang Dec. 1971 173 p refs
(Contract F33615-70-C-1649; AF Proj. 7371)
(AD-738631; UCLA-ENG-7169; AFML-TR-71-238) Avail: NTIS CSCL 20/12

A material process to grow device grade, Pb-Sn chalcogenide alloy, thin films on insulating substrates for long wavelength infrared applications was developed. Semiconductor behavior was characterized, and material properties of Pb-Sn chalcogenide alloys were determined. Author (GRA)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N72-28784*# Scientific Translation Service, Santa Barbara, Calif.
APPLICATION OF AN EJECTOR TO THE SOLUTION OF THE DESIGN PROBLEM OF PROPULSION SYSTEMS OF HIGH-SPEED VTOL AIRCRAFT
Ch. Storkebaum and L. V. Bonin Washington NASA Jun.

1972 23 p Transl. into ENGLISH of DFL, Brunswick Paper 64-573 from Proc. of the 4th Congr. of the Intern. Council of the Aeron. Sci. Washington, D. C., Spartan Books, Inc., 1965 p 555-573 Conf. held in Paris, 24-28 Aug. 1964
(Contract NASw-2035)
(NASA-TT-F-14305) Avail: NTIS HC $3.25 CSCL 21E

The structural design of an ejector is discussed which uses part of the exhaust power to increase the mass throughput required for thrust production, by suction of additional air from the atmosphere. The advantages associated with the use of the ejector concept are described. Author

N72-28785*# Bionetics Corp., Hampton, Va.
BIOWASTE RESISTOJET PROPELLANT SYSTEM BIOLOGICAL AND FUNCTIONAL ANALYSIS, TASK 3 Final Report
Jul. 1972 65 p refs
(Contract NAS1-10431)
(NASA-CR-111977) Avail: NTIS HC $5.25 CSCL 21I

Exhaust flow contamination aspects of the biowaste resistojet are studied by evaluating effects of operating pressure, temperature and composition. Biowaste propellant mixtures considered are comprised of: (1) The Sabatier reactor effluent; (2) the effluent of the cabin carbon dioxide molecular sieve; and (3) water and water vapor from various sources. Results show that plume shapes of resistojet thrusters in the 25 to 100 mlb range exhibit greater apex angles for a given density contour than a scaled inviscid jet. Operation at low thrust, low pressure and high temperature accentuates this pluming due to viscous effects in the nozzle flow. Since the biowaste resistojet effluent is traveling at high velocity in the plume away from the aircraft it is found to be a superior method of damping than the ambient venting. G.G.

N72-28786*# Pratt and Whitney Aircraft, East Hartford, Conn.
STUDIES FOR DETERMINING THE OPTIMUM PROPULSION SYSTEM CHARACTERISTICS FOR USE IN A LONG RANGE TRANSPORT AIRCRAFT
Gerald L. Brines Jul. 1972 39 p
(Contract NAS3-15550)
(NASA-CR-120950; PWA-4449) Avail: NTIS HC $4.00 CSCL 21E

A comprehensive evaluation of propulsion systems for the next generation of near-sonic long range transport aircraft indicates that socially responsive noise and emission goals can be achieved within the probable limits of acceptable airplane performance and economics. Technology advances needed in the 1975-1985 time period to support the development of these propulsion systems are identified and discussed. The single most significant result is the low noise, high performance potential of a low tip speed, spaced, two-stage fan. Author

N72-28787*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div.
LIQUID PROPELLANT THERMAL CONDITIONING SYSTEM TEST PROGRAM Final Report
B. R. Bullard 5 Jul. 1972 265 p refs
(Contract NAS3-12033)
(NASA-CR-72971; LMSC-D159262) Avail: NTIS HC $15.25 CSCL 21I

Results are presented from more than 1500 hours of testing on a liquid hydrogen thermal conditioning unit. Test parameters included: mixer and vent flow rates; tank size; ullage volume; pressurant gas; pressurant temperature; pressure level; and heat rate. Gaseous hydrogen and helium were used as pressurants. Analytical models were developed to correlate the test data and relate the performance to that anticipated in zero gravity. Experimental and theoretical results are presented which relate the variables controlling vapor condensation at a moving interface. Author

N72-28788# Delaware Univ., Newark. Dept. of Chemistry.
COMBUSTION CHARACTERISTICS OF CRYSTALLINE ROCKET OXIDIZERS Final Report
Harold C. Beachell Feb. 1972 67 p refs
(Grant AF-AFOSR-0922-67; AF Proj. 9713)
(AD-739994; AFOSR-72-0448TR) Avail: NTIS CSCL 21/9

The report describes a combustion research and testing program that has achieved one of its long range goals; that of providing new theory and practice for burning rate control of solid rocket propellants. In addition, new understanding has been added of the role played by the crystalline oxidizers used in those propellants. Author (GRA)

N72-28953* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SURFACE TENSIONS OF PROPELLANTS
R. Razouk *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 123-134 refs (For availability see N72-28941 19-34)
CSCL 21I

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N72-28789*# Aerojet Solid Propulsion Co., Sacramento, Calif.
A 156-IN.-DIA SRM MASS PROPERTIES REPORT
10 Mar. 1972 18 p
(Contract NAS8-28428)
(NASA-CR-123727; Rept-1917-MP1) Avail: NTIS HC $3.00 CSCL 21H

Mass property data for the 156-in.-dia SRM booster with two segments are presented. The SRM baseline booster has a fixed 15 deg canted nozzle and no thrust neutralization system. Summary mass property data for alternative booster configurations are included. Author

N72-28790# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
UNSTEADY FORCES ACTING ON TURBOMACHINE BLADES
Robert Legendre 1972 19 p refs Presented to the Working Group on Aeroelasticity in Turbomachinery, Indianapolis, 1-2 Jun. 1972; sponsored by Proj. SQUID
(Proj. SQUID)
(ONERA-TP-1101) Avail: NTIS HC $3.00

After a general survey of the work done worldwide to understand the origin of blade vibrations in turbomachines, the possibilities given by Poincare's uniformization process to inverse the flutter integral equations when two-dimensionality and incompressibility may be assumed are outlined. Data on theoretical development and compressibility effects are included. Author

N72-28791# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Elektrische Antriebe und Energieversorgung.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS ON AN ELECTROSTATIC ION THRUSTER WITH 18 CM DIAMETER
S. Baumgarth 1972 129 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-09) Avail: NTIS HC $8.50; DFVLR Porz-Wahn: 26 DM

As an example of a mission with electrostatic ion thrusters from a near earth parking orbit to a synchronous orbit with 2.5 kW electrical power at the spacecraft the geometrical size of the thruster is estimated. After the description of the electrostatic ion thruster ESKA-18P a simple theoretical model is developed describing the discharge. Including the inhomogeneous magnetic

field the quantitative results of the model are the mass flow injection to be optimum close to the anode and the main influence of the magnetic field on the discharge loss energy. These theoretical results are verified quantitatively by consecutive measurements. Finally the characteristic performance data of the thruster with minimum loss energies are concluded in diagrams and tables. Author

N72-28792# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Lampoldshausen (West Germany). Inst. fuer Chemische Raketenantriebe.

VELOCITY CAPABILITY OF THE SYMPHONIE-APOGEE-ENGINE-SYSTEM WITH BLOW DOWN OPERATION

D. Manski 1972 29 p refs In GERMAN; ENGLISH summary (DLR-Mitt-72-12) Avail: NTIS HC $3.50; DFVLR Porz-Wahn: 10,10 DM

The velocity capability of the Symphonie-apogee-engine-system with blow down operation is compared with the velocity requirement of the apogee maneuver for geostationary orbit. A calculation method is presented, which allows the velocity capability of rocket stages under blow down operation to be determined. The minimal allowable blow down beginning to attain successful missions is given. The computer program used is presented. Author

N72-28793*# General Electric Co., Cincinnati, Ohio.

HIGHLY LOADED MULTI-STAGE FAN DRIVE TURBINE: LEANED STATOR CONFIGURATION DESIGN

D. C. Evans and G. W. Wolfmeyer Washington NASA Jul. 1972 36 p refs
(Contract NAS3-14304)
(NASA-CR-2096; R71AEG309) Avail: NTIS HC $3.00 CSCL 21E

The results of the high lift blade configuration design study are reported. The three-stage constant-inside-diameter turbine utilizes a ten degree tangentially leaned stator in stage three. All other bladerows use plain blades. Analysis of the leaned stator is discussed, and detailed design data are summarized. Steady-state stresses are discussed, and the results of the mechanical design analysis are presented. Author

N72-28794*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AIRBREATHING ENGINES FOR SPACE SHUTTLE

Arthur J. Glassman, Warner L. Stewart, and Stanley M. Nosek 1972 27 p ref Proposed for presentation at Natl. Aerospace Eng. and Manuf. Meeting, San Diego, Calif., 2-5 Oct. 1972; Sponsored by the Soc. of Automotive Engr.
(NASA-TM-X-68098; E-7018) Avail: NTIS HC $3.50 CSCL 21A

The requirements imposed on the airbreathing engines by the shuttle mission and some results from engine design studies are discussed. In particular, some of the engine system weight study results are presented, potential problem areas and required engine modifications are identified, and testing requirements for a development and qualification program are discussed. The engines of interest for the shuttle are engines that are currently being developed for other applicatons. The potential problems, engine modifications, and testing requirements result primarily from the new environments associated with launch, space residence, and reentry. Author

N72-28795*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NEW TECHNOLOGY IN TURBINE AERODYNAMICS

Arthur J. Glassman and Thomas P. Moffitt 1972 34 p refs Proposed for presentation at Turbomachinery Symp., College Station, Texas, 24-26 Oct. 1972
(NASA-TM-X-68115; E-7059) Avail: NTIS HC $3.75 CSCL 21E

A cursory review is presented of some of the recent work that has been done in turbine aerodynamic research at NASA-Lewis Research Center. Topics discussed include the aerodynamic effect of turbine coolant, high work-factor (ratio of stage work to square of blade speed) turbines, and computer methods for turbine design and performance prediction. An extensive bibliography is included. Experimental cooled-turbine aerodynamics programs using two-dimensional cascades, full annular cascades, and cold rotating turbine stage tests are discussed with some typical results presented. Analytically predicted results for cooled blade performance are compared to experimental results. The problems and some of the current programs associated with the use of very high work factors for fan-drive turbines of high-bypass-ratio engines are discussed. Turbines currently being investigated make use of advanced blading concepts designed to maintain high efficiency under conditions of high aerodynamic loading. Computer programs have been developed for turbine design-point performance, off-design performance, supersonic blade profile design, and the calculation of channel velocities for subsonic and transonic flow fields. The use of these programs for the design and analysis of axial and radial turbines is discussed. Author

N72-28796*# Pratt and Whitney Aircraft, West Palm Beach, Fla.

SINGLE-STAGE EXPERIMENTAL EVALUATION OF TANDEM-AIRFOIL ROTOR AND STATOR BLADING FOR COMPRESSORS. PART 3: DATA AND PERFORMANCE FOR STAGE C

J. A. Brent and D. Clemmons Aug. 1972 127 p refs
(Contract NAS3-11158)
(NASA-CR-120938; PWA-FR-5028) Avail: NTIS HC $8.50 CSCL 20D

Stage C, comprised of tandem-airfoil rotor C and tandem-airfoil stator B, was designed and tested to establish performance data for comparison with the performance of conventional single-airfoil blading. Velocity diagrams and blade leading and trailing edge metal angles selected for the conventional rotor and stator blading were used in the design of the tandem blading. The rotor had an inlet hub/tip ratio of 0.8 and a design tip velocity of 757 ft/sec. At design equivalent rotor speed, rotor C achieved a maximum adiabatic efficiency of 91.8% at a pressure ratio of 1.31. The stage maximum adiabatic efficiency was 86.5% at a pressure ratio of 1.31. Author

N72-28797# Vought Aeronautics, Dallas, Tex.

A FEASIBILITY STUDY TO DEFINE INLET FLOW QUALITY AND DEVELOPMENT CRITERIA Final Report, 15 May 1971 - 15 Mar. 1972

H. Clyde Melick, Jr. Wright-Patterson AFB, Ohio AFAPL Mar. 1972 286 p refs
(Contract F33615-71-C-1500)
(AD-739858; AFAPL-TR-72-14) Avail: NTIS CSCL 21/5

A method has been developed for quantitatively accounting for flow non-uniformity in an inlet. This method is recommended for use as an additional indicator of design excellence during the early inlet development cycle, prior to the time firm engine indices can be established. A concept of flow quality, Q, has been defined for this purpose. It is related to the area weighted total pressure below average at the exit of the inlet system. This quality indicator can be related to all existing engine indices and was screened from 24 candidate definitions. The total pressure below average can be a function of time, in which case quality will include unsteady effects. GRA

N72-28798# Aerospace Research Labs., Wright-Patterson AFB, Ohio. Energy Conversion Research Lab.

THE PERFORMANCE CHARACTERISTICS OF THE 7/10'S NOZZLES IN THE FIVE FOOT SINGLE CHANNEL VERTICAL EJECTOR Final Report

Richard B. Fancher Oct. 1971 99 p refs
(AF Proj. 7116)
(AD-739863; ARL-71-0236) Avail: NTIS CSCL 21/5

The report is a contribution to the research of V/STOL propulsion. The results on a compact two-dimensional rectangular

ejector are described. Although thrust augmentation performance was not distinctive, some of the other findings are of value. There appears to be a definite relationship between the flow turning angle and ejector performance. Also an unexpected but beneficial mixing phenomena occurs when two adjacent jets merge. Penetration of the primary flow through the mixing section is important to ejector performance. GRA

N72-28799# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
THERMAL PERFORMANCE OF A GIMBALED SUPPORTED, OMNIDIRECTIONAL SUPERSONIC SPLIT LINE NOZZLE Technical Report, Jan. 1970 - Dec. 1971
R. W. Holder Mar. 1972 34 p
(AD-739881; AFRPL-TR-72-5) Avail: NTIS CSCL 21/8

An analysis of the erosion and char performance of a 2.6-inch-throat-diameter supersonic split-line nozzle exposed to a 650 psi chamber pressure solid propellant motor environment for 35 seconds was conducted. The nozzle was a lightweight nozzle design employing pyrolytic graphite washers in the throat with Graph-I-Tite G graphite on either side. Grafoil 101, graphite cloth phenolic and silica phenolic were used to insulate the 7075-T6 aluminum nozzle shell. The exit cone was reinforced with a fiberglass overwrap. The nozzle successfully demonstrated a 4-degree pitch and yaw capability. The pyrolytic graphite slates eroded at a rate of 0.76 mil per second in the throat plane. Author (GRA)

N72-28800# Army Foreign Science and Technology Center, Charlottesville, Va.
ORGANIZING THE COLLECTION AND ANALYSIS OF INFORMATION ABOUT THE OPERATION OF ENGINES IN USE AND DETERMINING THE LEVEL OF INITIAL OPERATING LIFE
V. D. Arshinov and V. S. Kiselev 14 Oct. 1971 16 p Transl. into ENGLISH from the monograph "Organizatsiya Sbora i Analiza Informatsii o Rabote Dvigatelei v Ekspluatstsii i Opredelenie Urovnya Motoresursa"
(AD-737967; FSTC-HT-23-1061-71) Avail: NTIS CSCL 21/7

The primary basis for an organized program of product improvement is thorough collection and analysis of data from using organizations. Close contact with selected users were established, exchanging support for information to improve or change engineering standards. GRA

N72-28801# Atlantic Research Corp., Alexandria, Va.
ADVANCED FUEL SYSTEMS FOR RAMJET-POWERED VEHICLES Technical Report, 30 Jun. 1969 - 30 Oct. 1971
Donald H. Sargent Feb. 1972 276 p refs
(Contract F33615-69-C-1849; AF Proj. 3012)
(AD-738634; TR-PL-9870-04-Vol-1; AFAPL-TR-72-1-Vol-1) Avail: NTIS CSCL 21/5

A study of advanced fuel systems for ramjet-powered vehicles is presented. The fuel considered in this study was the dense hydrocarbon RJ-5. Components of the fuel system studied included the fuel tank, tank pressurization subsystem, expulsion bladder, booster pump, transfer lines, valves, seals and insulation. Thermal conditioning is also evaluated. The fuel itself, RJ-5, was studied for design purposes, to evaluate storability, and to determine compatibility of the fuel with materials with which it might come into contact. A full-scale fuel system simulator is described to evaluate fuel system properties over a wide range of operating and test results are presented. GRA

N72-28951* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MINIMUM IMPULSE TESTS OF 0.45-N LIQUID HYDRAZINE CATALYTIC THRUSTERS
P. I. Moynihan *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 107-112 (For availability see N72-28941 19-34)
CSCL 21H

N72-28952* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MARINER 9 PROPULSION SUBSYSTEM PERFORMANCE DURING INTERPLANETARY CRUISE AND MARS ORBIT INSERTION
M. J. Cork, R. L. French, C. J. Leising, and D. D. Schmit *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 113-122 refs (For availability see N72-28941 19-34)
CSCL 21H

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation, and Van Allen radiation belts. For related information see also: 13 Geophysics; and 24 Physics, Atomic, Molecular, and Nuclear.

N72-28802*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Space Sciences Dept.
ANALYSIS OF INNER AND OUTER ZONE: OGO-1 AND OGO-2 ELECTRON SPECTROMETER AND ION CHAMBER DATA Final Report
K. A. Pfitzer 12 May 1972 46 p refs
(Contract NASw-2203)
(NASA-CR-127455; MDC-G2960) Avail: NTIS HC $4.50
CSCL 03B

The dynamic processes governing the acceleration and loss of electrons in the radiation zones are investigated. The radial diffusion coefficient was determined for a McIlwain parameter between 1.6 and 2.2 for electrons having a first adiabatic invariant of 12 MeV/gauss. The coefficient is larger than earlier values and suggests that there exists a lower limit to the fluxes in the inner zone. The agreement between observed and calculated magnetic fields and particle fluxes is improved by using solar wind pressure as input to the magnetic field models. Changes in the plasma pressure can cause apparent local time asymmetries in particle flux. A comparison of the magnetic field models with observed location of the trapping boundary also indicates the need for including distributed currents within the magnetosphere. The high latitude trapping boundary is only weakly dependent on A sub p, and the trapping boundary data are improved by including in the models a stand-off distance which varies with the plasma pressure. N.E.N.

N72-28803# Belgian Royal Observatory, Brussels. Dept. of Radio Astronomy and Solar Physics.
RADIOELECTRIC SOLAR ACTIVITY IN 1968: RADIOELECTRIC SOLAR OBSERVATIONS OF 600 MHz, PART 2 Annual Report [L'ACTIVITE RADIOELECTRIQUE SOLAIRE EN 1968. OBSERVATIONS RADIOELECTRIQUES SOLAIRES SUR 600 MHz]
C. Gonze-Delys and R. Gonze 1971 18 p refs In FRENCH *Its* Ciel et Terre, no. 6, 1971
(Commun-ORB-Ser-B-50; AR-29-Pt-2) Avail: NTIS HC $3.00

Solar radioelectric data are presented for the year 1968. Graphs, tables, and photographs are given from observations made at the Humain-Rochefort radio astronomy observatory in Belgium. Transl. by K.P.D.

N72-28804# Belgian Royal Observatory, Brussels. Dept. of Radio Astronomy and Solar Physics.
RADIOELECTRIC SOLAR ACTIVITY IN 1969: RADIOELECTRIC SOLAR OBSERVATIONS OF 600 MHz, PART 2 Annual Report [L'ACTIVITE RADIOELECTRIQUE SOLAIRE EN 1969. OBSERVATIONS RADIOELECTRIQUES SOLAIRES SUR 600 MHz]
C. Gonze 1972 24 p refs In FRENCH *Its* Ciel et Terre, no. 1, 1972
(Commun-ORB-Ser-B-61; AR-30-Pt-2) Avail: NTIS HC $3.25

Solar radioelectric observations at 600 MHz were conducted at the Humain-Rochefort radio astronomy observatory in Belgium.

Data for the year 1969 is presented in the form of graphs and tables. Transl. by K.P.D.

N72-28805# Belgian Royal Observatory, Brussels.
RADIOELECTRIC SOLAR ACTIVITY IN 1966 [ACTIVITE RADIOELECTRIQUE SOLAIRE EN 1966]
C. Delys and R. Gonze 1971 11 p In FRENCH *Its* Ciel et Terre, v. 87, no. 4, 1971
(Commun-ORB-Ser-B-32) Avail: NTIS HC $3.00

Radioelectric observations of the sun were made at the Humain-Rochefort radio astronomy observatory in Belgium. Tables and graphs are presented for the year 1966. Transl. by K.P.D.

N72-28806*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROVISIONAL HOURLY VALUES OF EQUATORIAL Dst FOR 1971
M. Sugiura and D. J. Poros (Computer Science Corp., Silver Spring, Md.) Jun. 1972 17 p ref
(NASA-TM-X-65930; X-645-72-200) Avail: NTIS HC $3.00 CSCL 03B

Tables and plots of provisional hourly values of the equatorial Dst index for 1971 are given, a table of daily mean Dst values for 1971 is also provided. The base line values for the four observatories, Hermanus, Kakioka, Honolulu, and San Juan, were obtained from extrapolations using the coefficients for the secular variations determined for the previous years. Examining the Dst values for quiet days, the base lines so determined appear to be slightly low, so that the Dst index for quiet periods tends to be high. Author

N72-28807# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
EQUILIBRIUM ENERGY SPECTRUM FOR THE GALACTIC COSMIC ELECTRONS
Paul K. Suh Jul. 1972 39 p refs Submitted for publication
(RE-432J) Avail: NTIS HC $4.00

A perturbational analysis of the cosmic electron diffusion equation is developed. In the high energy domain, cosmic electron diffusion parallel to the galactic disk slab appears not to affect significantly the determination of the equilibrium electron energy spectrum. Diffusion across the galactic disk slab in the high energy domain is examined in detail. An active cosmic electron leakage at the disk-halo boundaries, coupled with diffusion across the disk slab, sensitively affects the cosmic electron spectral behavior up to a considerably high energy domain. In the high energy domain, the closed-disk model appears to prevail. In the low energy domain, the leakage time may become comparatively long, thus leading to the possible validity of a quasi-open-disk model. Author

N72-28808*# Techtran Corp., Glen Burnie, Md.
THE UPPER LIMIT OF BRIGHTNESS FLUCTUATIONS OF BACKGROUND RADIATION IN THE 1-5 mm REGION
V. S. Soglasnova Washington NASA Jul. 1972 6 p refs Transl. into ENGLISH of "Verkhn. Predel Fluktuatsiy Yarkosti, Fonovogo Izlucheniya v Obl. ot 1 do 5 mm", Rept PR-87 Inst. of Space Res., Acad. Sci. USSR, Moscow, 1971 7 p
(Contract NASw-2037)
(NASA-TT-F-14377; PR-87) Avail: NTIS HC $3.00 CSCL 03B

Small scale brightness temperature fluctuations of background radiation were observed at the Crimean Astrophysical Observatory on an RT-22 telescope. The observations were conducted in May and June 1970 during nights with clear skies. The upper limit of the background fluctuations was determined to be < 0.122 K, corresponding to a flux of 1.4 x 10 to the -25th power W/m Hz. N.E.N.

N72-28809*# Techtran Corp., Glen Burnie, Md.
BOLOMETRIC MEASUREMENTS OF RELIC RADIATION
V. A. Soglasnova and G. B. Sholomitskiy Washington NASA Jul. 1972 6 p refs Transl. into ENGLISH from "O Bolometricheskik Izmereniyakh Reliktovogo Izlucheniya", Rept. PR-90 Inst. of Space Res., Acad. Sci. USSR, Moscow, 1971 p 3-8
(Contract NASw-2037)
(NASA-TT-F-14375; PR-90) Avail: NTIS HC $3.00 CSCL 03B

The feasibility of an alternative approach to measuring anisotropy, based on the use of wideband receivers, is examined. The method of measuring the velocity of the observer relative to the frame of reference, connected to the relic background is illustrated by way of example of Planckian spectrum and can be employed for non-Planckian spectrum of relic radiation. Author

N72-28810*# Translation Consultants, Ltd., Arlington, Va.
SOUNDING OF THE SOLAR CORONA BY MONOCHROMATIC RADIO RADIATION
O. G. Onishchenko Washington NASA Jul. 1972 22 p refs Transl. into ENGLISH from "Zondirovaniye Solnechnoy Korony Monokhromaticheskim Radioizlucheniyem", Inst. of Space Res., Acad. of Sci., Moscow, report PR-73, 1971 30 p
(Contract NASw-2038)
(NASA-TT-F-14347; PR-73) Avail: NTIS HC $3.25 CSCL 03B

A method of sounding the solar corona by monochromatic radio radiation on two coherent frequencies is presented. Estimates of regular group delay, of fluctuation in group delay, of rotation of the plane of polarization, and of expansion of the signal spectrum as a function of the beam's impact parameter for the accepted model of the solar corona and the interplanetary medium are cited. The inverse problem of obtaining certain mean distributions of electron concentrations, magnetic field, and solar wind velocity as a function of the heliocentric distance is reviewed. Author

N72-28811*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW INTENSITY BALMER EMISSIONS FROM THE INTERSTELLAR MEDIUM AND GEOCORONA
R. J. Reynolds, F. L. Roesler (Wisconsin Univ., Madison), and F. Scherb (Wisconsin Univ., Madison) Jun. 1972 21 p refs Submitted for publication
(NASA-TM-X-65967; X-672-72-259) Avail: NTIS HC $3.25 CSCL 03B

Galactic and non-galactic components of the diffuse H-alpha and H-beta night sky emissions were resolved with a Fabry-Perot spectrometer. The non-galactic component of both lines accounts for most of the emission at galactic latitudes greater than 30 deg. The intensities of the galactic component yield values for the average ionization rate per hydrogen atom that are between 10 to the minus 15th power and 10 to the minus 14th power s sup minus 1 assuming steady state ionization. Author

N72-28812*# California Univ., Berkeley.
ENERGETIC RADIATIONS FROM SOLAR FLARES Final Report, Mar. 1968 - Aug. 1971
K. A. Anderson Aug. 1971 42 p refs
(Contract NAS5-9094)
(NASA-CR-122509; SSL-Ser-13-Issue 50) Avail: NTIS HC $4.25 CSCL 03B

An experiment designed to measure energetic X-rays, electrons, protons and alpha particles from solar flares aboard OGO 5 is reported. A brief statement of the objectives of the experiment is followed by a description of the instrumentation including detector characteristics and associated electronics. The data handling system is then described and the operational history of the experiment is discussed. This is followed by a description of the format of the magnetic data tapes and a summary of the major computer processing programs. The measurements made with this experiment within the first year of its operation have led to several basic results regarding the role of non-thermal electrons in the physics of solar flares. These results are described in the papers listed in the bibliography given at the end of this report. Author

N72-28813# Lockheed Missiles and Space Co., Palo Alto, Calif.
SOME ASPECTS OF MEASURING THE DIFFERENTIAL SPECTRUM OF COSMIC RAYS
A. A. Kolchin, V. V. Lebedev, and G. P. Skrebtsov 1972 7 p refs Transl. into ENGLISH from Geomagn. Aeron. (USSR), v. 12, no. 3, 1972 p 392-397
Avail: NTIS HC 3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Factors affecting the accuracy of measuring the spectra of cosmic radiation particles in recording particle fluxes in several given energy bands are examined. It is shown that in a number of cases it is impossible to use such a characteristic of the instrument as the geometric factor. A general approach to computing the characteristic of the instrument intended to obtain the differential spectra of cosmic rays is described. When particle fluxes are measured, the experimental data are the pulse counting rates in the energy liberating band cut off by the logic circuits of the instrument and the appropriate selected kinetic energy band. These counting rates must be converted into actual particle flux intensities by using some counting characteristic of the instrument. A general approach to the computation of the characteristics of an instrument used to record the differential spectra of cosmic rays is described. Author

N72-28814# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
SCALING AND THE SECONDARY COSMIC ELECTRON-POSITRON SPECTRUM
John Dooher Aug. 1972 23 p refs Presented at Spring Meeting of the Am. Phys. Soc., Washington, D.C., 24-27 Apr. 1972
(RE-434J) Avail: NTIS HC $3.00

The secondary electron-positron component of high energy cosmic radiation is calculated. Using the Feynman scaling law for the inclusive pion distribution funcion, it is shown that the secondary positron-electron component will have the same power law as the primary electron component if the proton and electron injection spectra are the same. Numerical estimates are made using an appropriate fit of the pion single particle distribution function to accelerator data. The neutral pion gamma ray component is also discussed. Author

N72-28815# Panametrics, Inc., Waltham, Mass.
RESEARCH DIRECTED TOWARD THE DESIGN, DEVELOPMENT, CONSTRUCTION AND INSTALLATION OF INSTRUMENTATION TO STUDY ENERGY SPECTRA OF HIGH ENERGY SOLAR PROTONS IN POLAR CAP EVENTS. THE ARCAS PROTON PAYLOAD
Bach Sellers, Jean Luc Hunerwadel, and Frederick A. Hanser Jan. 1972 34 p refs
(Contract F19628-71-C-0086; AF Proj. 5710)
(AD-739930; AFCRL-72-0005; SR-1) Avail: NTIS CSCL 04/1

A payload for measurement of 7-150 MeV protons and 30-1000 MeV alpha particles has been designed, integrated into, and flown successfully on an Arcas rocket into a solar particle event at Thule on March 29, 1970. The T. M. system has only one channel (IRIG E). Data are transmitted and recorded on magnetic tape for each coincidence occurring in a two detector semiconductor telescope. Subsequently, these data are analyzed to determine the relative energy distributions, the angular distribution, the intensity of the energy distribution and the particle types. Author (GRA)

N72-28816# Liege Univ. (Belgium). Inst. d'Astrophysique.
THE SOLAR SPECTRUM FROM LAMBDA 7498 TO LAMBDA 12016: A TABLE OF MEASURES AND IDENTIFICATIONS Interim Report
J. W. Swensson, W. S. Benedict (Md. Univ.), L. Delbouille, and G. Roland 1972 447 p refs
(Contract F61052-69-C-0014; AF Proj. 7670; AF Proj. 8603)
(AD-739483; AFCRL-71-0502) Avail: NTIS CSCL 03/2

The extensive publication lists identify most of the lines appearing in the solar spectrum between 7498 A and 12016 A. The line list includes both solar lines and absorption lines occurring in the earth's atmosphere. The measurements on which this identification table is based were made by L. Delbouille and G. Roland from the Jungfraujoch International Scientific Station, Switzerland and were published in 1963. Author (GRA)

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N72-28817*# Chicago Univ., Ill.
HIGH VOLTAGE ELECTRON MICROSCOPY AND ELECTRON DIFFRACTION OF PYROXENES IN TYPE B LUNAR SAMPLES FROM APOLLO 11
Humberto Fernandez-Moran, Mitsuo Ohtsuki, Stefan S. Hafner, and David Virgo 8 Dec. 1969 23 p refs Presented at Apollo 11 Lunar Sci. Conf., Houston, Tex., 5-8 Jan. 1970
(Grants NGL-14-001-012)
(NASA-CR-127444) Avail: NTIS HC $3.25 CSCL 03B

Lunar pyroxene 10044 specimens cleaved and sectioned by diamond knife ultramicrotomy were examined by standard (75 to 100 kV) and high voltage (200 kV) electron microscopy and diffraction. Salient findings based on evaluation of 2000 plates show uniform 300 to 600 A-wide bands, probably corresponding to single crystal domains, with lattice spacings of 2. A High resolution bright and dark field images of iron-rich and magnesium-rich crystals were compared with corresponding electron diffraction patterns. Possible relations of observed structures to magnetic domains were considered. Author

N72-28818*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO 14 MISSION REPORT. SUPPLEMENT 7: INFLIGHT DEMONSTRATIONS
Jan. 1972 284 p refs
(NASA-TM-X-68691; NASA-TM-X-2410; NASA-TM-X-64611; NASA-TM-X-64641; MSC-04112-Suppl-7) Avail: NTIS HC $16.25 CSCL 22C

Experiments performed on board the Apollo 14 are reviewed. These include a liquid transfer demonstration during the transearth coast, electrophoresis separation, a composite casting demonstration, and a heat flow and convection demonstration. Author

N72-28819*# Mobil Research and Development Corp., Dallas, Tex. Field Research Lab.
NEUTRON DIE-AWAY EXPERIMENT FOR REMOTE ANALYSIS OF THE SURFACE OF THE MOON AND THE PLANETS, PHASE 3 Final Report, 1 Jun. 1970 - 30 Nov. 1971
W. R. Mills and L. S. Allen 16 Jun. 1972 174 p refs
(Contract NASw-1435)
(NASA-CR-127439) Avail: NTIS HC $10.75 CSCL 03B

Continuing work on the two die-away measurements proposed to be made in the combined pulsed neutron experiment (CPNE) for analysis of lunar and planetary surfaces is described. This report documents research done during Phase 3. A general exposition of data analysis by the least-squares method and the related problem of the prediction of variance is given. A data analysis procedure for epithermal die-away data has been formulated. In order to facilitate the analysis, the number of independent material variables has been reduced to two: the hydrogen density and an effective oxygen density, the latter being determined uniquely from the nonhydrogeneous elemental composition. Justification for this reduction in the number of variables is based on a set of 27 new theoretical calculations. Work is described related to experimental calibration of the

epithermal die-away measurement. An interim data analysis technique based solely on theoretical calculations seems to be adequate and will be used for future CPNE field tests. Author

N72-28820*# Kansas State Univ., Manhattan. Dept. of Physics.
INFRARED LABORATORY STUDIES OF SYNTHETIC PLANETARY ATMOSPHERES Semiannual Status Report, 1 Dec. 1971 - 31 May 1972
Dudley Williams 20 Jun. 1972 47 p refs
(Grant NGR-17-001-026)
(NASA-CR-127684) Avail: NTIS HC $4.50 CSCL 03B

The initial stages of the research were involved with a test of Burch's law of multiplicative transmittance for mixed absorbing gases when their lines are broadened by H2 and He, which are constituents of the atmospheres of the major planets. The broadening of individual lines in the CO fundamental by various gases was investigated. Line strength and half-width for individual CO lines were studied as a function of temperature. Measurements of total band absorptance as a function of absorber thickness and total effective pressure were made at various temperatures for bands of CO and N2O. Attempts were made to develop a phenomenological theory of line broadening that would account for the phenomena observed for the CO fundamental and those reported for more highly polar gases. Laboratory measurements of nitric acid vapor absorptance were compared with balloon measurements in arriving at an estimate of the quantity of nitric acid vapor present in the earth's atmosphere in the region of the ozone layer. Author

N72-28821*# South Carolina Univ., Columbia. Dept. of Chemistry.
INFRARED SPECTRA OF MOLECULES AND MATERIALS OF ASTROPHYSICAL INTEREST Quarterly Progress Report, 15 Dec. 1971 - 15 Mar. 1972
James R. Durig Mar. 1972 40 p refs
(Grant NGR-41-002-033)
(NASA-CR-127634; QPR-19) Avail: NTIS HC $4.00 CSCL 03B

Vibrational spectra were studied from 400 to 33/cm for molecules which may be present in the atmosphere of Jovian planets. The microwave spectrum of cis glyoxal was studied. Sources of color variation in the Jovian atmosphere were analyzed in relation to molecular crystals. The low frequency modes of acetaldehyde and acetaldehyde-d sub 4 are discussed. K.P.D.

N72-28822*# California Univ., Berkeley. Space Sciences Lab.
LUNAR SOIL PROPERTIES AND SOIL MECHANICS Semiannual Status Report, 20 Dec. 1971 - 20 Jun. 1972
James K. Mitchell, William N. Houston, and H. John Hovland Jun. 1972 35 p refs
(Grant NGR-05-003-406)
(NASA-CR-127637; SSL-Ser-13-Issue-60) Avail: NTIS HC $3.75 CSCL 03B

The study to identify and define recognizable fabrics in lunar soil in order to determine the history of the lunar regolith in different locations is reported. The fabric of simulated lunar soil, and lunar soil samples are discussed along with the behavior of simulated lunar soil under dynamic and static loading. The planned research is also included. F.O.S.

N72-28823*# Geological Survey, Washington, D.C.
DOCUMENTATION OF APOLLO 15 SAMPLES
R. L. Sutton, M. H. Hait, K. B. Larson, G. A. Swann, V. S. Reed, and G. G. Schaber Apr. 1972 275 p
(NASA Order T-65253-G)
(NASA-CR-127639; USGS-IR-NASA-47) Avail: NTIS HC $15.75 CSCL 03B

A catalog is presented of the documentation of Apollo 15 samples using photographs and verbal descriptions returned from the lunar surface. Almost all of the Apollo 15 samples were correlated with lunar surface photographs, descriptions, and traverse locations. Where possible, the lunar orientations of rock samples were reconstructed in the lunar receiving laboratory, using a collimated light source to reproduce illumination and shadow characteristics of the same samples shown in lunar photographs. In several cases, samples were not recognized in lunar surface photographs, and their approximate locations are known only by association with numbered sample bags used during their collection. Tables, photographs, and maps included in this report are designed to aid in the understanding of the lunar setting of the Apollo 15 samples. Author

N72-28824*# Geological Survey, Washington, D.C.
DOCUMENTATION AND ENVIRONMENT OF THE APOLLO 16 SAMPLES: A PRELIMINARY REPORT
26 May 1972 279 p ref
(NASA Order T-5874-A)
(NASA-CR-127638; USGS-IR-NASA-51) Avail: NTIS HC $16.00 CSCL 03B

A catalog which is a working document that shows the locations from which samples were collected during the Apollo 16 mission, and that provides a descriptive geologic context for each sample is presented. It is a compilation of notes from work in progress, and supersedes an earlier report prepared by the Apollo Lunar Geology Investigation Team. The information was obtained from the Air-to-Ground transcript from the astronaut crew, from lunar surface television, from 60 mm Hasselblad camera photographs, and from available LRL mugshot photographs of the samples. The sample descriptions are based on these sources of data. Author

N72-28825*# National Aeronautics and Space Administration, Washington, D.C.
MORPHOLOGY OF LUNAR ROCKS IN THE REGION TRANSVERSED BY LUNOKHOD 1
R. B. Zezin and A. T. Bazilevskiy Apr. 1972 7 p Transl. into ENGLISH from Priroda (Moscow), no. 1, Nov. 1971 p 7-9
(NASA-TT-F-14179) Avail: NTIS HC $3.00 CSCL 03B

Morphological study of the rocks in the region investigated by Lunokhod 1 is discussed. It is concluded, from the preliminary results, that the morphological evolution of the rocks is a link in the overall evolution of the microrelief of the lunar surface. Author

N72-28826*# Translation Consultants, Ltd., Arlington, Va.
SATELLITES IN THE SERVICE OF GEOGRAPHY
H. G. Gierloff-Emden and G. Kritikos Washington NASA Jun. 1972 11 p refs Transl. into ENGLISH from Weltraumfahrt Raketentechnik, v. 22, Oct. - Nov. 1971 p 165, 166, 168-170
(Contract NASw-2038)
(NASA-TT-F-14301) Avail: NTIS HC $3.00 CSCL 22C

Three examples of uses of satellites in geography are given. Land clearance by fire for farming in certain countries is described. Satellite shots permit supervision of this process and determination of wind directions from trails of smoke recorded on photos, which is useful in areas with limited meteorological services. The phenomenon of cloud coverage over most of central Europe is discussed. Local weather variations can be observed by satellite, where land and sea wind circulations create conditions different from the general meteorological situation. The use of satellite pictures in automatic printing of maps is also discussed. Computer processing by digital or chemical processes is feasible and a digital system using the equidensity method is described. It is comprised of a mechanical scanner, processor (resolution 7 lines/mm), and image reproduction devices. Threshold values of the density reference values are used for processing the images. Author

N72-28827*# TRW Systems Group, Redondo Beach, Calif.
STUDY OF A COMET RENDEZVOUS MISSION, VOLUME 1 Final Technical Report
12 May 1972 231 p refs Prepared for JPL

(Contracts NAS7-100; JPL-953247)
(NASA-CR-127562; TRW-20513-6006-R0-00-Vol-1) Avail: NTIS HC $13.75 CSCL 22A

The feasibility, scientific objectives, modes of exploration and implementation alternatives of a rendezvous mission to Encke's comet in 1984 are considered. Principal emphasis is placed on developing the scientific rationale for such a mission, based on available knowledge and best estimates of this comet's physical characteristics, including current theories of its origin, evolution and composition. Studied are mission profile alternatives, performance tradeoffs, preferred exploration strategy, and a spacecraft design concept capable of performing this mission. The study showed that the major scientific objectives can be met by a Titan IIID/Centaur-launched 17.5 kw solar electric propulsion spacecraft which carries 60 kg of scientific instruments and is capable of extensive maneuvering within the comet envelope to explore the coma, tail and nucleus. Author

N72-28828*# TRW Systems Group, Redondo Beach, Calif.
STUDY OF A COMET RENDEZVOUS MISSION. VOLUME 2: APPENDICES
12 May 1972 78 p Prepared for JPL
(Contracts NAS7-100; JPL-953247)
(NASA-CR-127561; TRW-20513-6006-R0-00-Vol-2) Avail: NTIS HC $6.00 CSCL 22A

Appendices to the comet Encke rendezvous mission consider relative positions of comet, earth and sun; viewing condition for Encke; detection of Taurid meteor streams; ephemeris of comet Encke; microwave and optical techniques in rendezvous mission; approach instruments; electrostatic equilibrium of ion engine spacecraft; comet flyby data for rendezvous spacecraft assembly; observations of P/Encke extracted from a compilation; and summary of technical innovations. G.G.

N72-28829*# Teledyne Brown Engineering, Huntsville, Ala.
SKYLAB EXPERIMENT PERFORMANCE EVALUATION MANUAL. APPENDIX P: EXPERIMENT T003 INFLIGHT AEROSOL ANALYSIS (DOT/MSFC)
K. S. Purushotham Jul. 1972 59 p refs
(Contract NAS8-21804)
(NASA-CR-61386) Avail: NTIS HC $5.00 CSCL 22C

A series of analyses is presented for experiment T003, inflight aerosol analysis, to be used for evaluating the performance of the Skylab corollary experiments under preflight, inflight, and post-flight conditions. Experiment contingency plan workaround procedure and malfunction analyses are presented in order to assist in making the experiment operationally successful. Author

N72-28830*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MASS INFLUX OBTAINED FROM LLLTV OBSERVATIONS OF FAINT METEORS
Robert J. Naumann and K. Stuart Clifton Washington Jul. 1972 23 p refs Presented at IAU Colloq. No. 13, The Evolutionary and Phys. Probl. of Meteorids, Albany
(NASA-TN-D-6868; M-445) Avail: NTIS HC $3.00 CSCL 03B

Since the advent of low light level television (LLLTV) systems, it has been recognized that such devices offer the ability to observe meteors as faint as 10th magnitude which allows the extension of optical meteor data to masses as small as 0.0001 grams. The Space Sciences Lab at Marshall Space Flight Center has been actively engaged in such observations using image orthicons and intensified SEC vidicons. The results of these observations are presented along with an interpretation in terms of mass-flux. This interpretation includes the development of a relationship between peak luminosity of a meteor and mass, velocity, and zenith angle that was derived from single body meteor theory and compares favorably with results obtained from the Artificial Program. Also included in the mass flux interpretation is an analysis of the observation response of a LLLTV system to fixed and moving point sources. Author

N72-28831*# System Development Corp., Santa Monica, Calif.
THE APPLICATION OF GENERALIZED, CYCLIC, AND MODIFIED NUMERICAL INTEGRATION ALGORITHMS TO PROBLEMS OF SATELLITE ORBIT COMPUTATION
Leonard Chesler and Sam Pierce 15 Mar. 1971 216 p refs
(Contract NAS5-11875)
(NASA-CR-122442; SDC-TM-4717) Avail: NTIS HC $13.00 CSCL 22C

Generalized, cyclic, and modified multistep numerical integration methods are developed and evaluated for application to problems of satellite orbit computation. Generalized methods are compared with the presently utilized Cowell methods; new cyclic methods are developed for special second-order differential equations; and several modified methods are developed and applied to orbit computation problems. Special computer programs were written to generate coefficients for these methods, and subroutines were written which allow use of these methods with NASA's GEOSTAR computer program. Author

N72-28832*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO 15 MISSION REPORT
Dec. 1971 325 p
(NASA-TM-X-68394; MSC-05161) Avail: NTIS HC $18.25 CSCL 22C

A detailed discussion is presented of the Apollo 15 mission, which conducted exploration of the moon over longer periods, greater ranges, and with more instruments of scientific data acquisition than previous missions. The topics include trajectory, lunar surface science, inflight science and photography, command and service module performance, lunar module performance, lunar surface operational equipment, pilot's report, biomedical evaluation, mission support performance, assessment of mission objectives, launch phase summary, anomaly summary, and vehicle and equipment descriptions. The capability of transporting larger payloads and extending time on the moon were demonstrated. The ground-controlled TV camera allowed greater real-time participation by earth-bound personnel. The crew operated more as scientists and relied more on ground support team for systems monitoring. The modified pressure garment and portable life support system provided better mobility and extended EVA time. The lunar roving vehicle and the lunar communications relay unit were also demonstrated. N.E.N.

N72-28833*# National Aeronautics and Space Administration, Washington, D.C.
FIVE-YEAR PLAN FOR SPACE RESEARCH
F. K. Schroeder Jul. 1972 91 p Transl. into ENGLISH from Arbeitsgemeinschaft Weltraumforsch. (Munich), Feb. 1972 87 p
(NASA-TT-F-14331) Avail: NTIS HC $6.75 CSCL 22A

The various research programs and proposed experiments in the fields of extraterrestrial research and biophysics are listed. Proposals and suggestions for initial developmental efforts, systems studies, and facilities design approaches are also delineated. Author

N72-28834*# Techtran Corp., Glen Burnie, Md.
ON THE POSSIBILITY OF CREATING A MICROCLIMATE ON A SECTION OF THE LUNAR SURFACE
I. T. Atmanov Washington NASA Jul. 1972 26 p refs Transl. into ENGLISH from Acad. of Sci., Inst. of Space Res., Moscow, report Pr-188
(Contract NASw-2037)
(NASA-TT-F-14376; PR-188) Avail: NTIS HC $3.50 CSCL 03B

The possibility of decreasing the amplitude of temperature fluctuations on a section of the lunar surface in the course of a lunar day is examined. Data also cover changes in the mean temperature of the selected section within wide limits during a lunar day, effect of thermal conductivity of the lunar soil, effects of a thermal source on the surface, and the thermal capacity of the source on the temperature field in the surface layer of the lunar soil located under thermal insulation. Author

N72-28835*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE EARTH ORBITAL RENDEZVOUS TARGETING TECHNIQUES FOR NEAR CIRCULAR TARGET SATELLITE ORBITS
A. W. Deaton 27 Jun. 1972 27 p refs
(NASA-TM-X-64675) Avail: NTIS HC $3.50 CSCL 22C

The targeting techniques are developed which are required to determine the guidance reference release time of the space shuttle navigation system, the orbital insertion targeting values, and a time line of orbital maneuvers. An extension is made for rendezvous with a target satellite in an elliptical orbit. Author

N72-28836*# Boeing Co., Houston, Tex.
USERS GUIDE FOR GUIDANCE AND CONTROL LAUNCH AND ABORT SIMULATION FOR SPACECRAFT (LASS), VOLUME 1
T. F. Havig and H. D. Backman 30 Jun. 1972 191 p
(Contract NAS9-12183)
(NASA-CR-115716; D2-118387-1A) Avail: NTIS HC $11.75 CSCL 22C

The mathematical models and computer program which are used to implement LASS are described. The computer program provides for a simulation of boost to orbit and abort capability from boost trajectories to a prescribed target. The abort target provides a decision point for engine shutdown from which the vehicle coasts to the vicinity of the selected abort recovery site. The simulation is a six degree of freedom simulation describing a rigid body. The vehicle is influenced by forces and moments from nondistributed aerodynamics. An adaptive autopilot is provided to control vehicle attitudes during powered and unpowered flight. A conventional autopilot is provided for study of vehicle during powered flight. Author

N72-28837*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
MICROPHYSICAL, MICROCHEMICAL AND ADHESIVE PROPERTIES OF LUNAR MATERIAL. 3: GAS INTERACTION WITH LUNAR MATERIAL
J. J. Grossman, N. R. Mukherjee, and J. A. Ryan 1972 34 p refs
(Contract NAS9-11680)
(NASA-CR-115707) Avail: NTIS HC $3.75 CSCL 03B

Knowledge of the reactivity of lunar material surfaces is important for understanding the effects of the lunar or space environment upon this material, particularly its nature, behavior and exposure history in comparison to terrestrial materials. Adsorptive properties are one of the important techniques for such studies. Gas adsorption measurements were made on an Apollo 12 ultrahigh vacuum-stored sample and Apollo 14 and 15 N2-stored samples. Surface area measurements were made on the latter two. Adsorbate gases used were N2, A, O2 and H2O. Krypton was used for the surface area determinations. Runs were made at room and liquid nitrogen temperature in volumetric and gravimetric systems. It was found that the adsorptive/desorptive behavior was in general significantly different from that of terrestrial materials of similar type and form. Specifically (1) the UHV-stored sample exhibited very high initial adsorption indicative of high surface reactivity, and (2) the N2-stored samples at room and liquid nitrogen temperatures showed that more gas was desorbed than introduced during adsorption, indicative of gas release from the samples. The high reactivity is a scribed cosmic ray track and solar wind damage. Author

N72-28838*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div.
LUNAR MISSION SAFETY AND RESCUE: ESCAPE/RESCUE ANALYSIS AND PLAN
15 Jul. 1971 353 p refs
(Contract NAS9-10969)
(NASA-CR-115415; MSC-03978-Rev-1;
LMSC-A984262D-Rev-1) Avail: NTIS HC $19.75 CSCL 22C

The results are presented of the technical analysis of escape/rescue/survival situations, crew survival techniques, alternate escape/rescue approaches and vehicles, and the advantages and disadvantages of each for advanced lunar exploration. Candidate escape/rescue guidelines are proposed and elements of a rescue plan developed. The areas of discussions include the following: lunar arrival/departure operations, lunar orbiter operations, lunar surface operations, lunar surface base escape/rescue analysis, lander tug location operations, portable airlock, emergency pressure suit, and the effects of no orbiting lunar station, no lunar surface base, and no foreign lunar orbit/surface operations on the escape/rescue plan. Author

N72-28839*# Lockheed Missiles and Space Co., Palo Alto, Calif. Space Systems Div.
LUNAR MISSION SAFETY AND RESCUE: HAZARDS ANALYSIS AND SAFETY REQUIREMENTS
15 Jul. 1971 413 p refs
(Contract NAS9-10969)
(NASA-CR-115416; MSC-03977; MSC-A984262C) Avail: NTIS HC $22.75 CSCL 22C

The results are presented of the hazards analysis which was concerned only with hazards to personnel and not with loss of equipment or property. Hazards characterization includes the definition of a hazard, the hazard levels, and the hazard groups. The analysis methodology is described in detail. The methodology was used to prepare the top level functional flow diagrams, to perform the first level hazards assessment, and to develop a list of conditions and situations requiring individual hazard studies. The 39 individual hazard study results are presented in total. Author

N72-28840*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div.
LUNAR MISSION SAFETY AND RESCUE: EXECUTIVE SUMMARY
15 Jul. 1971 24 p refs
(Contract NAS9-10969)
(NASA-CR-115417; MSC-03975-Rev-1;
LMSC-A984262A-Rev-1) Avail: NTIS HC $3.25 CSCL 22C

An executive summary is presented of the escape/rescue and the hazards analyses for manned missions and operations in the 1980 time frame. The method of approach, basic data generated, and significant results are outlined, and highlights of the two analyses are given. Areas in which research or technical development efforts could improve mission safety, and specific suggestions for additional effort studies on safety analyses are listed. N.E.N.

N72-28841*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div.
LUNAR MISSION SAFETY AND RESCUE: TECHNICAL SUMMARY
15 Jul. 1971 174 p refs
(Contract NAS9-10969)
(NASA-CR-115418; MSC-03976-Rev-1;
LMSC-A9842628-Rev-1) Avail: NTIS HC $10.75 CSCL 22C

A technical summary is presented of the escape/rescue and the hazards analyses for manned missions and operations in the 1980 time frame. Hazards are interpreted as hazards to man, not to equipment, program schedule, or program objectives. Hazards in 39 individual areas are analyzed, and corrective measures are recommended. Over 200 safety guidelines are proposed, based on significant hazards. Escape and rescue situtations and requirements are identified and analyzed, and escape/survival/rescue concepts are defined to cope with each escape/rescue situation. Areas in which research or technical development efforts could improve mission safety are identified. It is concluded that the primary emphasis should be on survival and escape provisions, with rescue required only where self-help cannot bring the endangered crewmen to a safe haven. N.E.N.

N72-28842*# Library of Congress, Washington, D.C.
CURVED ROADS TO SPACE
NASA Jul. 1972 27 p Transl. into ENGLISH of a Russian film text Moscow, Soviet Central Sci. Film Enterprise, 1972 26 p
(NASA-TT-F-14533) Avail: NTIS HC $3.50 CSCL 22A

A translation of the sound track of a film commemorating Cosmonauts Dobrovolskiy, Volkov, and Patsayev is presented. The events of the flight are reviewed, and it is pointed out that tragedies accompanied all explorations. N.E.N.

N72-28843*# California Univ., Berkeley. Space Sciences Lab.
LUNAR SOIL PROPERTIES AND SOIL MECHANICS. FLOW IN POROUS MEDIA UNDER RAREFIED GAS CONDITIONS. RESEARCH PHASE: FLUID CONDUCTIVITY OF LUNAR SURFACE MATERIALS Final Report
F. C. Hurlbut and C. R. Jih May 1972 44 p refs
(Grant NGR-05-003-406)
(NASA-CR-122506; SSL-Ser-13-Issue-43) Avail: NTIS HC $4.25 CSCL 13M

Theoretical and experimental research on fluid conductivity of lunar surface materials is summarized. Theoretical methods were developed for the analysis of transitional and free-molecular flows, and for analysis of lunar permeability probe data in general. Experimental studies of rarefied flows under conditions of a large pressure gradient show flows in the continuum regime to be responsible for the largest portion of the pressure drop between source and sink for one dimensional flow, provided the entrance Knudsen number is sufficiently small. The concept of local similarity leading to a universal nondimensional function of Knudsen number was shown to have approximate validity; flows in all regimes may be described in terms of an area fraction and a single length parameter. Synthetic porous media prepared from glass beads exhibited flow behavior similar in many regards to that of a natural sandstone; studies using artificial stones with known pore configurations may lead to new insight concerning the structure of natural materials. The experimental method involving the use of segmented specimens of large permeability is shown to be fruitful. Author

N72-28844# Lockheed Missiles and Space Co., Palo Alto, Calif.
DETERMINATION OF THE ANGULAR LOCATION OF AN UNORIENTED ASTRONOMICAL SATELLITE
E. N. Kaurov and V. I. Prokhorenko 1972 6 p Transl. into ENGLISH from Kosmich. Issled. (Moscow), v. 10, no. 2, 1972 p 217-222
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A method for determining the angular location of an unoriented satellite by measuring the vector of the earth's magnetic field intensity and the brightness of stars incident in the field of view of the photoelectric sensors is presented. The numerical relationships involved are explained by mathematical models. Examples of some orbits with identified stars are presented where the trajectories of the viewing beam of the star sensors on the celestial sphere are shown. Author

N72-28845*# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PERFORMANCE OF BOEING LRV WHEELS IN A LUNAR SOIL SIMULANT. REPORT 1: EFFECT OF WHEEL DESIGN AND SOIL
A. J. Green and K.-J. Melzer Dec. 1971 83 p refs Supersedes M-70-15
(NASA Order H-68683-A)
(NASA-CR-127695; M-71-10; M-70-15; Rept-1) Avail: NTIS HC $6.25 CSCL 03B

Six versions of the wire mesh wheel were laboratory tested in a lunar soil simulant, consisting of a crushed basalt with a grainsize distribution similar to that of samples collected during Apollo 11 and 12 flights, to determine their relative performance. The consistency of the soil was varied to cover a range of cohesive and frictional properties to simulate soil conditions assumed to exist on the moon. Programmed-slip and constant-slip tests conducted with the single wheel dynamometer system showed that the performance of the wheel covered with a metal chevron tread over 50 percent of its contact surface was slightly superior to that of other tread designs. Author

N72-28846*# Translation Consultants, Ltd., Arlington, Va.
POSITION OF THE LUNAR CENTER OF MASS ACCORDING TO PHOTOGRAMMETRIC ANALYSIS AND LUNAR ORBITER 1 DATA
Yu. N. Lipskiy, V. A. Nikonov, and T. P. Skobeleva Washington NASA Aug. 1972 5 p refs Transl. into ENGLISH from Kosmich. Issled. (Moscow), v. 10, Jan - Feb., 1972 p 141-142
(Contract NASw-2038)
(NASA-TT-F-14514) Avail: NTIS HC $3.00 CSCL 03B

The position of the lunar center of mass (CM) with respect to the physical surface of the visible hemisphere was fixed in the Mills-2 reference system. This CM position was based on 73 CM radii obtained by Lunar Orbiter 1 and 9 CM radii obtained by the photogrammetric analysis of Compton and Wells. Author

N72-28847# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE LARGE MAGELLANIC CLOUD: ITS TOPOGRAPHY OF 1830 VARIABLE STARS. VIEWS ON THE PHYSICAL TRIPLET: THE MAGELLANIC CLOUDS AND THE MILKY WAY. THE GALACTICAL BINARY: THE ANDROMEDA NEBULA AND THE MILKY WAY
Sergei Illarionovich Gaposhkin May 1972 84 p
(SAO-Special-Rept-310; SAO-905-204) Avail: NTIS HC $6.25

The topographic study is based on 1.2 million photographic and several thousand photovisual observations obtained on 2000 Harvard plates covering the years 1893 to 1961. The distribution of all variables, especially the peripheral ones, is almost circular so that the Large Magellanic Cloud (LMC) appears en face. A direct method provided 55 individual determinations of the modulus of LMC. The period-luminosity relation for Cepheids is expressed in absolute magnitude. A possible significance of the numerous small star clusters, or miniclusters, is suggested. A varied interrelationship among 34 bright ridges, 20 dark lanes, and variables and other classes of stars is presented. Light curves for 1128 Cepheids, 76 eclipsing variables, and 105 long-periodics and semiregulars are given. A new kind of variable, called Undecoded, is identified. Irregular variables are divided in irregular normal and irregular important classes. A peculiar minicluster is situated in the vicinity of the variables LMV 1689 and 1690 and is almost in midway between the LMC and the Milky Way. The LMC appears to be the most important of all galaxies, including the Milky Way. Author

N72-28848*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A DISCUSSION OF CO AND O ON VENUS AND MARS
Mikio Shimizu Jun. 1972 24 p refs Submitted for publication
(NASA-TM-X-65950; X-620-72-209) Avail: NTIS HC $3.25 CSCL 03B

The absorption of solar ultraviolet radiation in the wavelength range 2000 to 2200 A by CO2 strongly reduces the dissociation rate of HCl on Venus. The Cl catalytic reaction for the rapid recombination of O and CO and the yellow coloration of the Venus haze by OCl(-) and Cl3(-) appears to be unlikely. At the time of the Martian dust storm, the dissociation of H2O in the vicinity of the surface may vanish. The increase of dissociation at high altitudes, however, can be the source of H atoms in the upper atmosphere. The H atoms from the dissociation of hydrides may catalyze the recombination of CO and O in the lower atmospheres of these planets according to the following scheme: H + CO + M yields HCO + M, and HCO + O yields H + CO2. In the case of Venus, there may be other kinds of sinks for the photodissociation products, and its chemical environment might be more complex than that of Mars. Author

N72-28849*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC COERCIVITY AND FERROMAGNETIC SPECIES IN LUNAR MATERIALS
Peter Wasilewski (George Washington Univ., Washington, D. C.) Jun. 1972 34 p refs Submitted for publication
(NASA-TM-X-65953; X-644-72-162) Avail: NTIS HC $3.75 CSCL 03B

Lunar samples have reduced coercive force, high values of R sub H (ratio of remanent coercive force to coercive force), and constriction in their magnetic hysteresis loops due to the presence of superparamagnetic and multidomain iron grains. The high R sub H values are also attributable to the magnetic shape effects of the iron grains. Spheres, cubes, and needles, as well as more irregular metal grains were observed. The coercive force values are quite meaningless unless the size and shape distributions are determined. The R sub H and the ratio of saturation remanence to saturation magnetization values can be considered characteristic of the size and shape modes of the ferromagnetic grains in a natural sample, and a classification of natural materials based on their hysteresis characteristics is presented with special reference to lunar samples. Author

N72-28850*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SENSOR LIGHTING CONSIDERATIONS FOR EARTH OBSERVATORY SATELLITE MISSIONS
J. L. Cooley Jun. 1972 52 p refs Submitted for publication
(NASA-TM-X-65955; X-551-72-202) Avail: NTIS HC $4.75 CSCL 22C

Facets of sensor lighting conditions for Earth observatory satellite missions are considered. Assuming onboard sensors of a given width viewing perpendicular to the subsatellite ground track along sun-synchronous orbits with various nodes, the ground trace of the ends of the sensor coverage were found, as well as the variation in solar illumination on the ground across the line covered by the sensor during the day for any point along the orbit. The changes with season and variation during the year were also found. Author

N72-28851# Grumman Aerospace Corp., Bethpage, N.Y. System Sciences.
OPTIMAL TRAJECTORIES FOR THE FLYBACK SHUTTLE
H. Gardner Moyer Jul. 1972 39 p refs
(RE-433) Avail: NTIS HC $4.00 CSCL 22C

A new procedure for the optimization of branched-path systems is successfully applied to flyback shuttle trajectories. The boundary and transversality conditions are satisfied by three extremals that meet at an arbitrarily chosen branch point. The position of the branch point is then improved, and the cycle repeated. The performance index for the orbiter branch is the weight placed in orbit. For the booster-return branch it is the square of the distance between the final point and the landing field. The complete family of trajectories representing the various tradeoffs between these two indices is calculated for a problem that specifies the landing field as coinciding with the launvh site. The computer program also has the capability of handling downrange landing sites, orbital rendezvous and intercept, and aerodynamic load constraints. Author

N72-28852*# Translation Consultants, Ltd., Arlington, Va.
PECULIARITIES OF LUNAR STUDIES BY RADIOSONDE OBSERVATION FROM THE SURFACE
V. V. Andreyanov Washington NASA Aug. 1972 16 p refs Transl. into ENGLISH of "Osobennosti Issledovaniya Luny Metodami Radiozondirovaniya s Poverkhnosti", Rept. Pr-94 Inst. of Space Res., Academy of Sci. USSR, Moscow, 1972 21 p
(Contract NASw-2038)
(NASA-TT-F-14374) Avail: NTIS HC $3.00 CSCL 03B

The peculiarities of using radio frequencies to study the moons's electrical characteristics, and those of the structure of its outer layers from its surface are reviewed. The physical conditions for measurements on the earth and the moon are compared, and the possibility of using ground methods and calculation relationships are discussed. The required correction factors are introduced. It is shown that the determination of the moon's electrical properties in the 0.1-10 MHz band can be extended to depths of hundreds, and sometimes thousands, of meters. The electrical characteristics and the depth of the outer layer, as well as the electrical characteristics of the underlying layer, can be measured when the stratum is layered. Author

N72-28853# Royal Observatory, Edinburgh (Scotland).
REPORT OF THE ASTRONOMER ROYAL FOR SCOTLAND FOR THE YEAR ENDING 31 MARCH 1972
London Sci. Res. Control 1972 15 p refs
Avail: NTIS HC $3.00

Observational, laboratory, and theoretical work on the interstellar medium and young stars are described. Star clusters, spacial distribution of stars, and the galactic structure were studied with UBV photometry. Other research includes Michelson stellar interferometry, infrared astronomy, rocket observations of stars in the UV, satellite tracking, and the S2/68 experiment carried on the TD-1 satellite. N.E.N.

N72-28854*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENTAL DETERMINATION OF POTENTIAL LUNAR SURFACE ORGANIC CONTAMINATION IN THE LUNAR MODULE DESCENT ENGINE EXHAUST
Donald A. Flory, Bernd R. Simoneit (Calif. Univ., Berkeley), Alma L. Burlingame (Calif. Univ., Berkeley), and Irwin D. Smith (White Sands Test Facility) Washington Aug. 1972 94 p refs
(NASA-TR-R-389; MSC-S-233) Avail: NTIS HC $3.00 CSCL 03B

The objective of the lunar module descent-engine exhaust-gas sampling program was to analyze the organic combustion products generated by the lunar module descent engine. From a cosmo-chemical and geochemical viewpoint, the carbonaceous compounds of higher molecular weight were of particular interest. Phase 1 of the program consisted of fabricating and test firing a model rocket engine to gain preliminary experience with the sample collection system. Phase 2 consisted of the installation and use of the sample collection system to analyze lunar module descent engine exhaust. Several series of samples collected from the exhausts of the model rocket engine and the lunar module descent engine were analyzed by various methods, especially high resolution mass spectrometry. Virtually all lunar module descent engine exhaust products were found to be low-molecular-weight nitrogen compounds. Author

N72-28855*# Boeing Co., Houston, Tex.
ORBITER ABORTS FROM BOOST: PRESIMULATION REPORT
H. D. Backman and K. G. Brechka 30 Jun. 1972 113 p refs
(Contract NAS9-12183)
(NASA-CR-115715; Rept-5-2581-HOU-090) Avail: NTIS HC $7.75 CSCL 22A

A description of a hybrid simulation of the 040C orbiter aborting from boost to specified landing site is provided. The simulation starts when the abort is initiated and continues until a terminal energy state (associated with the selected landing site) is reached. At abort it is assumed that all SRM's are jettisoned with the external tank remaining with the orbiter. The simulation described has six degrees of freedom with the vehicle simulated as a rigid body. A conventional form of autopilot is provided to control engine gimbaling during powered flight. An ideal form of an autopilot is provided to test conventional autopilot function and provide pseudo RCS function during coasting flight. The simulation is proposed to provide means for studies of abort guidance function and to gain information concerning ability to control the abort trajectory. Author

N72-28856# European Southern Observatory, Hamburg (West Germany).
EUROPEAN SOUTHERN OBSERVATORY RESEARCH

ACTIVITIES, TELESCOPES, AND AUXILIARY EQUIPMENT Annual Report, 1970
1970 67 p
Avail: NTIS HC $5.50

Research activities at the European Southern Observatory for CERN in Chile are discussed, including galactic structure, external galaxies, the Magellanic clouds, and meteorology. The 3.6 m telescope and Schmidt telescope projects are reviewed. Instruments, auxiliary equipment, buildings, and grounds are described. General financial and administrative policy are presented. K.P.D.

N72-28857# Copenhagen Observatory (Denmark).
MASS LOSS AND EVOLUTION IN CLOSE BINARIES
Kjeld Gyldenkerne, ed. and Richard M. West, ed. 1970 238 p refs Proc. of the Intern. Astron. Union Colloq. No. 6, Elsinore, Den., 15-19 Sep. 1969
Avail: NTIS HC $14.00

An introductory talk on present knowledge of masses and radii of eclipsing binary stars is followed by talks on observational facts of binary mass loss and theoretical compilations of the evolution of close binaries. Extensive discussions follow each paper and a summary of both lectures and discussions is given. For individual titles, see N72-28858 through N72-28860.

N72-28858 California Univ., Los Angeles.
KNOWLEDGE OF MASSES AND RADII OF ECLIPSING BINARIES AND THEIR ACCURACY
Daniel M. Popper *In* Copenhagen Obs. Mass Loss and Evolution In Close Binaries 1970 p 13-62 refs (For availability see N72-28857 19-30)

The current situation on masses and radii as determined from eclipsing binary stars is reviewed including a discussion of the reliability of results appearing in published catalogs. The following aspects are discussed in detail: interpretation of light curves and spectrograms, catalogs of photometric and spectrographic elements, and lists of masses and radii.
Author (ESRO)

N72-28859 Pennsylvania Univ., Philadelphia.
OBSERVATIONAL FACTS OF BINARY MASS LOSS
Robert H. Koch *In* Copenhagen Obs. Mass Loss and Evolution in Close Binaries 1970 p 65-135 refs (For availability see N72-28857 19-30)

Present observational data and interpretation of the results of the rate of loss of mass from closed binary components are critically discussed from three viewpoints. The viewpoints cover: (1) diagnosis of a binary by the HR diagram and mass-luminosity and mass-radius relations, (2) period changes which are inferred to derive from changes or conservation of energy and momentum, and (3) abundance analyses pointing to anomalies in chemical composition. Author (ESRO)

N72-28860 Polish Academy of Sciences, Warsaw. Inst. of Astronomy.
CLOSE BINARIES: THEORETICAL COMPUTATIONS
B. Paczynski *In* Copenhagen Obs. Mass Loss and Evolution in Close Binaries 1970 p 139-210 refs (For availability see N72-28857 19-30)

The phases of binary star evolution are discussed with emphasis on assumptions made in model compilations. The limitations imposed by the assumptions are considered and a comparison made between models and observations.
Author (ESRO)

N72-28861# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Mechanical Engineering.
RAPID ESTIMATES OF COVARIANCE MATRICES FOR MANEUVERING SPACE VEHICLE
C. N. Shen 1972 11 p refs
(Contract DAAB07-69-C-0365)
(AD-739604) Avail: NTIS CSCL 22/3

A technique is developed for the trajectory parameter tracking of a thrust-maneuvering orbital vehicle when neither the time of the thrusting maneuver nor the magnitude or direction of the thrust vector are known by the tracking observer. The reduced problem of tracking an orbital vehicle constrained to planar movement is examined in order to develop a method of approach applicable to the general tracking problem. A new measurable covariance matrix is introduced to augment the standard sequential parameter estimation scheme and provide a rapid estimate of both the state and its error covariance immediately following a thrusting maneuver. Author (GRA)

N72-28862# Naval Research Lab., Washington, D.C. Mathematics and Information Sciences Div.
SUMMARY OF THRUST REQUIREMENTS FOR LAUNCH INTO VARIOUS ORBITS IN CISLUNAR SPACE Interim Report
Bernard Kaufman and Robert Dasenbrock Mar. 1972 24 p refs
(AD-739680; NRL-MR-2400) Avail: NTIS CSCL 22/3

The total velocity requirements, from a parking orbit, for launches into various orbits in cislunar space are determined. The parking orbit is a 100 n.mi. altitude circular orbit inclined 30 degrees to the equator. Three different situations are used: (1) a Hohmann transfer to a circular orbit at the same inclination, (2) a two-burn optimal transfer to a cicular equatorial orbit, and (3) a three-burn non optimal transfer to an equatorial orbit. Also presented are the delta V requirements to transfer to a coplanar eccentric orbit of 300 n.mi. at perigee and variable apogee.
Author (GRA)

N72-28863# Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.
ANALYSIS OF KALMAN FILTER MECHANIZATIONS FOR AN IDEALIZED ROCKET LAUNCH
Harold L. Pastrick 3 Jan. 1972 38 p refs
(DA Proj. 1X2-63306-D-073)
(AD-739911; RG-TR-72-4) Avail: NTIS CSCL 12/1

A study is performed to estimate various states of a vehicle launched from an idealized spherical, airless, nonrotating earth. A tracking radar measures slant range and elevation of the vehicle and yields an output which is corrupted by additive Gaussian noise. In addition, the vehicle is disturbed by a random specific force during its boost phase. Estimation of the vehicle states is done by two different Kalman Filter mechanizations which are linearized applications of the optimal theory. A Monte Carlo computer simulation is used to compare the performance of the two filter mechanizations. Author (GRA)

N72-28864# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass. Space Physics Lab.
GEOPHYSICS AND SPACE DATA BULLETIN, VOLUME 8, NO. 4, FOURTH QUARTER 1971
Anne L. Carrigan, ed. Mar. 1972 290 p refs
(AF Proj. 8666-01-01)
(AD-740001; AFCRL-72-0168; AFCRL-SR-134) Avail: NTIS CSCL 03/2

The Bulletin is a quarterly publication that contains AFCRL contract and inhouse data reported from sites throughout the world. The following types of data are contained within each issue: magnetometer, cosmic ray, ELF noise, riometer, solar optical and radio emission, and ionosonde. This issue covers such data for October, November, December 1971.
Author (GRA)

N72-28865# Yale Univ. Observatory, New Haven, Conn.
THE DYNAMICAL EVOLUTION OF TRIPLE STAR SYSTEMS: A NUMERICAL STUDY
E. Myles Standish, Jr. Mar. 1972 34 p refs
(Contract N00014-67-A-0097-0018; Grant NSF GP-26495; NR Proj. 044-239)

(AD-739729) Avail: NTIS CSCL 03/3

The initial conditions for 800 triple star systems are created and the evolution is followed, usually until the escape of one member. It is found that the angular momentum of the system is the quantity most influential in determining the following distributions: the time of disintegration, the velocity and mass of the escaping particle, the semi-major axis, eccentricity and angular momentum of the remaining binary. These quantities are displayed graphically and discussed. Author (GRA)

N72-28866# Rensselaer Polytechnic Inst., Troy, N.Y.
OPTICAL FILTERING FOR NONLINEAR PARAMETER UPDATING OF THE MARTIAN ATMOSPHERE
C. N. Shen and J. C. Duke 1971 7 p refs Presented at the Symp. of the Intern. Federation of Autom. Control, Kyoto, 9-15 Aug. 1971
(Contract DAAB07-69-C-0365)
(AD-739616) Avail: NTIS CSCL 03/2

A technique is developed for on-board computation of the Mars troposphere density parameters using a maximum likelihood sequential filtering estimate. Author (GRA)

N72-28867# Aeronautical Chart and Information Center, St. Louis, Mo. Technical Translation Section.
ASTRONOMIC CIRCULAR NO. 605, 1971
V. V. Terentev, I. E. Zalkalne, Yu. N. Lipskii, and Zh. F. Rodionova Mar. 1972 17 p refs Transl. into ENGLISH from Astron. Tsirkulyar (USSR), no. 605, 5 Feb. 1971
(AD-739379; ACIC-TC-1830) Avail: NTIS CSCL 03/3

The report contains a translation of the following titles contained in Astronomic Circular No. 605: on the problem of small eccentricities in the theory of satellite motion; On comet and minor planets collision; and, Hypsometry of the moon's surface. Author (GRA)

N72-28868# Aeronautical Chart and Information Center, St. Louis, Mo. Technical Translation Section.
ASTRONOMIC CIRCULAR NUMBER 627, 1971
V. A. Nikonov, Yu. N. Lipskii, T. P. Skobeleva, and V. A. Bronshten Mar. 1972 16 p refs Transl. into ENGLISH from Astron. Tsirkulyar (USSR), no. 627, 7 Jun. 1971
(AD-739378; ACIC-TC-1829) Avail: NTIS CSCL 03/1

The report is a translation of the following titles contained in Astronomic Circular number 627: Results of adjustment of the positions of the centers of selenodetic catalogs in the Mills-2 system; The position of the center of figure of the visible side of the moon in the system of nine selenodetic catalogs; Reduction of nine selenodetic catalogs to the center of figure of the visible side of the moon; and More about the anamalous water in Venus' clouds. Author (GRA)

N72-28942* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A VIEW OF THE MOON
R. G. Brereton *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 1-11 refs (For availability see N72-28941 19-34)
CSCL 03B

N72-28943* Boeing Co., Seattle, Wash.
MARINER VENUS-MERCURY 1973 MISSION SOLAR PROTON ENVIRONMENT: FLUENCE AND DOSE
J. R. Thomas *In* JPL JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 12-28 refs (For availability see N72-28941 19-34)
CSCL 03B

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N72-28869* National Aeronautics and Space Administration, Washington, D.C.
ENVIRONMENTAL STATEMENT FOR NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, OFFICE OF SPACE SCIENCE, LAUNCH VEHICLE AND PROPULSION PROGRAMS Draft Environmental Impact Statement
1 Aug. 1972 86 p refs
(NASA-TM-X-68392) Avail: NASA Public Document Rooms, $1.00 CSCL 22D

NASA OSS Launch Vehicle and Propulsion Programs are responsible for the launch of approximately 20 automated science and applications spacecraft per year. These launches are for NASA programs and those of other U. S. government agencies, private organizations, such as the Comsat Corporation, foreign countries, and international organizations. Launches occur from Cape Kennedy, Florida; Vandenberg Air Force Base, California; Wallops Island, Virginia; and the San Marco Platform in the Indian Ocean off Kenya. Spacecraft launched by this program contribute in a variety of ways to the control of and betterment of the environment. Environmental effects caused by the launch vehicles are limited in extent, duration, and intensity and are considered insignificant. Author

N72-28870*# Arizona Univ., Tucson. Engineering Experiment Station.
CONTROL SYSTEM ESTIMATION AND DESIGN FOR AEROSPACE VEHICLES WITH TIME DELAY Final Report
G. R. Allgaier and T. L. Williams Jun. 1972 66 p refs
(Grant NGR-03-002-115)
(NASA-CR-127464) Avail: NTIS HC $5.50 CSCL 22B

The problems of estimation and control of discrete, linear, time-varying systems are considered. Previous solutions to these problems involved either approximate techniques, open-loop control solutions, or results which required excessive computation. The estimation problem is solved by two different methods, both of which yield the identical algorithm for determining the optimal filter. The partitioned results achieve a substantial reduction in computation time and storage requirements over the expanded solution, however. The results reduce to the Kalman filter when no delays are present in the system. The control problem is also solved by two different methods, both of which yield identical algorithms for determining the optimal control gains. The stochastic control is shown to be identical to the deterministic control, thus extending the separation principle to time delay systems. The results obtained reduce to the familiar optimal control solution when no time delays are present in the system. Author

N72-28871*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
INFLIGHT DYNAMICS TESTING OF THE APOLLO SPACECRAFT
William H. Peters and Bernard Marchantel Mar. 1972 37 p refs
(NASA-TM-X-58089; MSC-06755) Avail: NTIS HC $4.00 CSCL 22C

Response of the Apollo command module, service and lunar module airframe while in a docked configuration in the flight environment was measured in a frequency band encompassing the first two bending modes. Transfer characteristics from thrust-application point to control-system sensor were examined. The frequency and the stability margins of the first two predominant structural resonances were verified by the test. This

report describes the flight test that was performed and the postflight data analysis. Author

N72-28872*# Techtran Corp., Glen Burnie, Md.
SATELLITES AT THE HANOVER SHOW AND NEWS OF FRENCH SATELLITES
P. Langereux Washington NASA Jun. 1972 12 p Transl. into ENGLISH from Air Cosmos (France), no. 432, 22 Apr. 1972 p 9, 19, 26 and 27
(Contract NASw-2037)
(NASA-TT-F-14313) Avail: NTIS HC $3.00 CSCL 22B

The European satellites which were displayed at an aeronautical show in Hanover, Germany are described. Data are furnished concerning the configuration and performance of various missiles and space probes. The proposed launch dates and planned space missions for missiles still in development are examined. Cost analyses for several space programs are included. P.N.F.

N72-28873*# Chrysler Corp., New Orleans, La. Space Div.
ABORT STAGING CHARACTERISTICS OF AN EXTERNAL OXYGEN TANK SEPARATING FROM THE SPACE SHUTTLE 040-A ORBITER (.006 SCALE MODEL) AT MACH NUMBERS OF 0.6, 2.0, AND 4.0
Ivy Fossler and Paul Cole Jun. 1972 167 p
(Contract NAS8-4016)
(NASA-CR-120041; DMS-DR-1241; NASA-Ser-S-0076) Avail: NTIS HC $10.50 CSCL 22B

Experimental aerodynamic investigations were conducted on a .006 scale model of the space shuttle 040-A orbiter and its external fuel tank utilizing the NASA/MFSC dual sting support system in the MFSC 14 x 14 inch Trisonic Wind Tunnel. Normal force, pitching moment and axial force components were recorded simultaneously on the orbiter and the tank at selected tank field positions beneath the orbiter as both models were pitched through an angle of attack range of -5 deg to 20 deg. Incidence angles between orbiter and tank of 0 deg, 5 deg, 10 deg and 15 deg were investigated. During these tests Mach number was set at 0.6, 2.0 and 4.0. Author

N72-28874*# Chrysler Corp., New Orleans, La. Space Div.
HEAT TRANSFER TESTS OF THE MCDONNELL-DOUGLAS DELTA WING ORBITER MATED WITH -17A BOOSTER AT MACH NUMBER 8
R. K. Matthews, W. R. Martindale, and J. D. Warmbrod May 1972 118 p
(Contract NAS8-4016)
(NASA-CR-120067; DMS-DR-1262-Vol-1; NASA-Ser-H-1011) Avail: NTIS HC $8.00 CSCL 22B

A wind tunnel test program to determine aerodynamic heat transfer distributions on the McDonnell-Douglas configurations is reported. The tests were conducted at the Arnold Engineering Development Center (AEDC) in Tunnel B of the von Karman Gas Dynamics Facility (VKF). Heat-transfer rates were determined by the phase-change paint technique on 0.011-scale Stycast models using Tempilaq as the surface temperature indicator. The nominal test conditions were; Mach 8, freestream unit Reynolds numbers of 0.8 x one million, 2.5 x one million, and 3.7 x one million, and angles of attack of -5 deg, 0 deg, +5deg. Model details, test conditions, phase-change paint photographs and reduced heat-transfer coefficients are presented. Author

N72-28875*# Chrysler Corp., New Orleans, La. Space Div.
HEAT TRANSFER TEST OF THE MCDONNELL-DOUGLAS DELTA WING ORBITER AND THE -17A BOOSTER (NOT MATED) AT MACH NUMBER 8, VOLUME 2
R. K. Matthews, W. R. Martindale, and J. D. Warmbrod May 1972 164 p
(Contract NAS8-4016)
(NASA-CR-120068; DMS-DR-1262-Vol-2; NASA-Ser-H-1013; NASA-Ser-H-1017) Avail: NTIS HC $10.25 CSCL 22B
For abstract, see N72-28874.

N72-28876*# Martin Marietta Corp., Denver, Colo.
SYSTEMS-LEVEL STUDY OF A NONSURVIVABLE JUPITER TURBOPAUSE PROBE. VOLUME 3: APPENDIXES Final Report, 4 Jun. 1971 - 4 Mar. 1972
R. S. Wiltshire Jun. 1972 147 p refs 3 Vol.
(Contract NAS5-11445)
(NASA-CR-122440; MCR-72-91-Vol-3) Avail: NTIS HC $9.50 CSCL 22B
For abstract see N72-27933

N72-28877*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: SPACE SHUTTLE ABORT SEPARATION PRESSURE INVESTIGATION. VOLUME 2, PART A: ORBITER DATA AT MACH 5 Wind Tunnel Test Data Report
L. L. Trimmer (ARO, Inc.), D. A. Love (Lockheed Missles and Space Co., Huntsville, Ala.), J. M. Rampy (Northrop Serv., Inc.), J. P. Decker (NASA. Langley Res. Center), K. L. Blackwell (NASA. Manned Spaceflight Center)06(ARO, Inc.), and W. T. Strike Jun. 1972 500 p refs
(Contract NAS8-4016)
(NASA-CR-120061; DMS-DR-1174) Avail: NTIS HC $27.00 CSCL 22B

Pressure data obtained from a joint Langley Research Center (LaRC)/Marshall Space Flight Center (MSFC) space shuttle abort stage separation wind tunnel test are presented. The .00556 scale models of the McDonnell-Douglas orbiter and booster configurations were tested in proximity in Tunnel A of the Von Karman Facility (VKF), Arnold Engineering Development Center (AEDC). Data were obtained for nominal Mach numbers of 5.0, 3.0, and 2.0 and nominal Reynolds numbers of 1.09, 1.60, and 1.74 million per foot, respectively. Pressure data were obtained for the booster upper surface and orbiter lower surface at angles of attack of -10, -5, 0, 5, and 10 deg for zero degrees sideslip. The models were tested at incidence angles of 0 and 5 deg for several separation distances and power conditions. Plug nozzles utilizing air were used to simulate booster and orbiter plumes at various altitudes along a nominal ascent trajectory. Powered conditions were 100, 50, and 0 percent of full power for the orbiter and 100, 50 and 0 percent of full power for the booster. Data were also obtained with the booster canard off in close proximity. Author

N72-28878*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
THE MANAGEMENT APPROACH TO THE NASA SPACE STATION DEFINITION STUDIES AT THE MANNED SPACECRAFT CENTER
Jack C. Heberlig Jun. 1972 61 p
(NASA-TM-X-58090; MSC-06750) Avail: NTIS HC $5.25 CSCL 22B

The overall management approach to the NASA Phase B definition studies for space stations, which were initiated in September 1969 and completed in July 1972, is reviewed with particular emphasis placed on the management approach used by the Manned Spacecraft Center. The internal working organizations of the Manned Spacecraft Center and its prime contractor, North American Rockwell, are delineated along with the interfacing techniques used for the joint Government and industry study. Working interfaces with other NASA centers, industry, and Government agencies are briefly highlighted. The controlling documentation for the study (such as guidelines and constraints, bibliography, and key personnel) is reviewed. The historical background and content of the experiment program prepared for use in this Phase B study are outlined and management concepts that may be considered for future programs are proposed. Author

N72-28879*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DISASTER WARNING SATELLITE STUDY
Mar. 1971 112 p refs
(NASA-TM-X-68122) Avail: NTIS HC $7.75 CSCL 22B

The Disaster Warning Satellite System is described. It will provide NOAA with an independent, mass communication system for the purpose of warning the public of impending disaster and issuing bulletins for corrective action to protect lives and property. The system consists of three major segments. The first segment is the network of state or regional offices that communicate with the central ground station; the second segment is the satellite that relays information from ground stations to home receivers; the third segment is composed of the home receivers that receive information from the satellite and provide an audio output to the public. The ground stations required in this system are linked together by two, separate, voice bandwidth communication channels on the Disaster Warning Satellites so that a communications link would be available in the event of disruption of land line service. Author

N72-28880*# North American Rockwell Corp., Tulsa, Okla.
HEAT RESISTANT COMPOSITE STRUCTURE FOR SHUTTLE APPLICATIONS (RYTON-B)
21 Jul. 1972 96 p refs
(Contract NAS9-12297)
(NASA-CR-115713; TD-72-20) Avail: NTIS HC $7.00 CSCL 22B

A program was undertaken to characterize Ryton-B resin, develop graphite filament prepregs, undirectional laminates and determine the strength and heat resistance of the composite system. Through the use of a water soluble resin binder, high quality prepreg tape, three inches wide with 4 tows of HM-S were produced. The tape laminated to 0.00175 inch per ply. A wide range of properties in the cured resin and laminate were found using different curing conditions. The thermal stability and strength of molded laminates appears to be very dependent upon the cure cycle used for polymerization. Author

N72-28881*# TRW Systems Group, Redondo Beach, Calif.
PARTICLES AND FIELDS SUBSATELLITE PROGRAM Final Report
Harry J. Horn Feb. 1972 175 p refs
(Contract NAS9-10800)
(NASA-CR-115677; TRW-8220.57-1-68) Avail: NTIS HC $10.75 CSCL 22C

The development and characteristics of the Particles and Fields Lunar Subsatellite are discussed. The basic mission is to investigate two problems in space physics: (1) the formation and dynamics of the earth's magnetosphere and (2) the boundary layer of the solar wind as it flows over the lunar surface. Illustrations of the subsatellites and the mission concepts are included. Author

N72-28882*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE LIQUID METAL SLIP RING EXPERIMENT FOR THE COMMUNICATIONS TECHNOLOGY SATELLITE
R. R. Lovell 1972 8 p refs Proposed for presentation at the Natl. Telecommunications Conf., Houston, Tex., 4-6 Dec. 1972; sponsored by IEEE
(NASA-TM-X-68114; E-7056) Avail: NTIS HC $3.00 CSCL 22B

The experiment is designed to demonstrate liquid metal slip ring (LMSR) performance in a space environment. An evaluation was made of the features of the LMSR where improvement in performance over conventional slip rings was expected. The primary measurements to be made in the experiment will allow a determination of the slip ring electrical resistance, between ring insulation and ring cleanliness. Author

N72-28883*# National Aeronautics and Space Administration, Washington, D.C.
SPACE TRANSPORT VEHICLE: PURPOSE, REQUIREMENTS AND PROBLEMS
V. Vasilyev and L. Leonidov Jul. 1972 7 p Transl. into ENGLISH from Aviats. i Kosmonavt. (Moscow), no. 6, Jul. 1972 p 38-39
(NASA-TT-F-14526) Avail: NTIS HC $3.00 CSCL 22B

The development and utilization of space transport vehicles are discussed. The specific problems in structure and configuration of space transport vehicles are examined. The types of propulsion systems and expected performance are described. The proposed missions are outlined and the cost effectiveness with respect to current spacecraft operations is analyzed. P.N.F.

N72-28884*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WATER LANDING CHARACTERISTICS OF A MODEL OF A WINGED REENTRY VEHICLE
Sandy M. Stubbs Washington Aug. 1972 37 p refs
(NASA-TN-D-6859; L-8228) Avail: NTIS HC $3.00 CSCL 22C

Proposed manned space shuttle vehicles are expected to land on airport runways. In an emergency situation, however, the vehicle may be required to land on water. A 1/10-scale dynamic model of a winged reentry vehicle was investigated to determine the water landing characteristics. Two configurations of the proposed vehicle were studied. Configuration 1 had a 30 deg negative dihedral of the stabilizer-elevon surface whereas configuration 2 had a 30 deg positive dihedral. Results indicate that the maximum normal accelerations for configurations 1 and 2 when landing in calm water were approximately 8g and 6g, respectively, and the maximum longitudinal accelerations were approximately 5g and 3g, respectively. A small hydroflap was needed to obtain satisfactory calm-water landings with configuration 2, whereas configuration 1 gave good landings without a hydroflap. All landings made in rough water resulted in unsatisfactory motions. For landings made in three different wave sizes, both configurations dived. The maximum normal accelerations for configurations 1 and 2 when landing in waves were -10.1g and -18.7g, respectively, and the maximum longitudinal accelerations for both configurations were approximately 13g. Author

N72-28885*# Scientific Translation Service, Santa Barbara, Calif.
THE USE OF A SYSTEM OF VARIABLE STRUCTURE TO CONTROL THE FLIGHT RANGE OF A SPACECRAFT REENTERING THE EARTH'S ATMOSPHERE
I. S. Ukolov, ed., Ye. A. Tyurin, E. I. Mitroshin, and B. N. Petrov, ed. Washington NASA Aug. 1972 20 p refs Transl. into ENGLISH from Trans. of the 20 Intern. Symp. of IFAC for Automatic Control in the Peaceful Use of Outer Space, Vienna, Sep. 1967; Nauka Press (Moscow), 1971 p 471-481
(Contract NASw-2035)
(NASA-TT-F-14386) Avail: NTIS HC $3.00 CSCL 22B

A method of constructing a control system is proposed that uses nonlinear systems. It is found that using systems of variable structure to control a re-entering spacecraft provides low sensitivity to changes in the spacecraft parameters. Author

N72-28886*# General Dynamics/Convair, San Diego, Calif.
INVESTIGATION OF SAFE-LIFE FAIL-SAFE CRITERIA FOR THE SPACE SHUTTLE
18 May 1972 300 p refs
(Contract NAS1-6024)
(NASA-CR-112049) Avail: NTIS HC $17.00 CSCL 22B

An investigation was made to determine the effects of a safe-life design approach and a fail-safe design approach on the space shuttle booster vehicle structure, and to recommend any changes to the structural design criteria. Two configurations of the booster vehicle were considered, one incorporating a delta wing (B-9U configuration) and the other a swept wing (B-16B configuration). Several major structural components of the booster were studied to determine the fatigue life, safe-life, and fail-safe capabilities of the baseline design. Each component was investigated to determine the practicability of applying a safe-life or fail-safe design philosophy, the changes such design approaches might require, and the impact of these changes on weight, cost, development plans, and performance. Author

N72-28887*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPILATION OF WEIGHTS, BALANCE, CG, AND MOMENTS OF INERTIA FOR SOUNDING ROCKET PAYLOADS
John J. Wolff, Jr. and John F. Fitz Jul. 1972 35 p
(NASA-TM-X-65966; X-743-72-257) Avail: NTIS HC $3.75 CSCL 22B

A compilation of weight, balance, center of gravity, and moments of inertia of various sounding rocket payloads are presented. A permanent record of the physical characteristics of sounding rocket payloads in one location is provided. Data for the weight of payloads which the sounding rockets can support are developed. Illustrations of various sounding rockets to show the space available for payloads are included. Author

N72-28888*# Vought Missiles and Space Co., Dallas, Tex.
ATMOSPHERIC RENDEZVOUS FEASIBILITY STUDY
A. D. Schaezler Washington NASA Jun. 1972 114 p refs
(Contract NAS1-9994)
(NASA-CR-2040; Rept-00.1481) Avail: NTIS HC $3.00 CSCL 22C

A study was carried out to determine the feasibility of using atmospheric rendezvous to increase the efficiency of space transportation and to determine the most effective implementation. It is concluded that atmospheric rendezvous is feasible and can be utilized in a space transportation system to reduce size of the orbiter vehicle, provide a powered landing with go-around capability for every mission, and achieve lateral range performance that exceeds requirements. A significantly lighter booster and reduced launch fuel requirements are additional benefits that can be realized with a system that includes a large subsonic airplane for recovery of the orbiter. Additional reduction in booster size is possible if the airplane is designed for recovery of the booster by towing. An airplane about the size of the C-5A is required. Author

N72-28889*# North American Rockwell Corp., Downey, Calif. Space Div.
ESTABLISHMENT OF DESIGN CRITERIA FOR ACCEPTABLE FAILURE MODES AND FAIL SAFE CONSIDERATIONS FOR THE SPACE SHUTTLE STRUCTURAL SYSTEM Final Report
R. W. Westrup 1 Jun. 1972 344 p refs
(Contract NAS8-27269)
(NASA-CR-123725; SD-72-SH-0046) Avail: NTIS HC $19.25 CSCL 22B

Investigations of fatigue life, and safe-life and fail-safe design concepts as applied to space shuttle structure are summarized. The results are evaluated to select recommended structural design criteria to provide assurance that premature failure due to propagation of undetected crack-like defects will not occur during shuttle operational service. The space shuttle booster, GDC configuration B-9U, is selected as the reference vehicle. Structural elements used as basis of detail analyses include wing spar caps, vertical stabilizer skins, crew compartment skin, orbiter support frame, and propellant tank shell structure. Fatigue life analyses of structural elements are performed to define potential problem areas and establish upper limits of operating stresses. Flaw growth analyses are summarized in parametric form over a range of initial flaw types and sizes, operating stresses and service life requirements. Service life of 100 to 500 missions is considered. Author

N72-28890*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTER PROGRAM FOR INVESTIGATING EFFECTS OF NONLINEAR SUSPENSION-SYSTEM ELASTIC PROPERTIES ON PARACHUTE INFLATION LOADS AND MOTIONS
Lamont R. Poole Washington Aug. 1972 46 p
(NASA-TM-X-2592; L-8390) Avail: NTIS HC $3.00 CSCL 01C

A computer program is presented by which the effects of nonlinear suspension-system elastic characteristics on parachute inflation loads and motions can be investigated. A mathematical elastic model of suspension-system geometry is coupled to the planar equations of motion of a general vehicle and canopy. Canopy geometry and aerodynamic drag characteristics and suspension-system elastic properties are tabular inputs. The equations of motion are numerically integrated by use of an equivalent fifth-order Runge-Kutta technique. Author

N72-28891*# Boeing Co., Houston, Tex.
USER'S GUIDE FOR GUIDANCE AND CONTROL LAUNCH AND ABORT SIMULATION FOR SPACECRAFT (LASS), VOLUME 2
T. F. Havig and H. D. Backman 30 Jun. 1972 267 p 2 Vol.
(Contract NAS9-12183)
(NASA-CR-115717; D2-118387-2A-Vol-2) Avail: NTIS $15.50 CSCL 22A

Flow charts, symbol dictionaries, and computer program listings for guidance and control launch and abort simulation for spacecraft are presented. Author

N72-28892*# Germantown Labs., Inc., Philadelphia, Pa.
DESIGN, TESTING, FABRICATION AND LAUNCH SUPPORT OF A LIQUID CHEMICAL BARIUM RELEASE PAYLOAD (UTILIZING THE LIQUID FLUORINE-BARIUM SALT/HYDRAZINE SYSTEM)
C. S. Stokes, E. W. Smith, and W. J. Murphy [1972] 118 p refs
(Contract NAS1-7709)
(NASA-CR-112106) Avail: NTIS HC $8.00 CSCL 22B

A payload was designed which included a cryogenic oxidizer tank, a fuel tank, and burner section. Release of 30 lb of chemicals was planned to occur in 2 seconds at the optimum oxidizer to fuel ratio. The chemicals consisted of 17 lb of liquid fluorine oxidizer and 13 lb of hydrazine-barium salt fuel mixture. The fuel mixture was 17% barium chloride, 16% barium nitrate, and 67% hydrazine, and contained 2.6 lb of available barium. Two significant problem areas were resolved during the program: explosive valve development and burner operation. The release payload was flight tested, from Wallops Island, Virginia. The release took place at an altitude of approximately 260 km. The release produced a luminous cloud which expanded very rapidly, disappearing to the human eye in about 20 seconds. Barium ion concentration slowly increased over a wide area of sky until measurements were discontinued at sunrise (about 30 minutes). Author

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N72-28893 National Lending Library for Science and Technology, Boston Spa (England).
STRENGTH CALCULATION OF PRESSURE VESSELS WITH SPECIAL REFERENCE TO THEIR LIFE
G. Sterr 30 Mar. 1972 12 p Transl. into ENGLISH from Tech. Ueberwach. (West Germany), v. 12, no. 2, Feb. 1971 p 37-42
(NLL-CE-Trans-5752-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The effect of load cycles on the service life of a pressure vessel is examined. It is determined that the service life is significantly affected after 1,000 or more load cycles, which is equivalent to one start-up per week for 20 years. The data is applied to formulating safety regulations for pressure vessel operation. Author

N72-28894 Hamburger Flugzeugbau G.m.b.H. (West Germany).
ESTIMATION OF ENDURANCE OF LIGHT METAL LUGS WITH INTERFERENCE FIT BUSHES
O. Goekgoel 20 Jun. 1971 53 p refs In GERMAN; ENGLISH summary
(UH-25-71) Avail: Issuing Activity

A light metal lug with an interference fit bush which corresponds to a prestressed bolted connection under tensile load is discussed. In either case, the object of prestressing consists in reducing the working stress amplitudes, which results in an increased service life. The influence of bush interference on stress mechanism, which so far had been examined by several authors using mathematical or photoelastic methods, is examined by means of stress measurements on test lugs. Evaluations of selective fatigue tests showed that the endurance of a lug fitted with an interference bush is not exclusively determined by stress reduction. Due to the interference the resistance to fretting corrosion will also be improved, which additionally increases the fatigue behaviour. Author

N72-28895*# Arizona Univ., Tucson. Engineering Experiment Station.
CONTROL SYSTEM ESTIMATION AND DESIGN FOR AEROSPACE VEHICLES Progress Report
R. T. Stefani, T. L. Williams, and S. J. Yakowitz May 1972 69 p refs
(Grant NGR-03-002-115)
(NASA-CR-127456) Avail: NTIS HC $5.50 CSCL 22B

The selection of an estimator which is unbiased when applied to structural parameter estimation is discussed. The mathematical relationships for structural parameter estimation are defined. It is shown that a conventional weighted least squares (CWLS) estimate is biased when applied to structural parameter estimation. Two approaches to bias removal are suggested: (1) change the CWLS estimator or (2) change the objective function. The advantages of each approach are analyzed. Author

N72-28896*# Boeing Co., Seattle, Wash. Aerospace Group.
FUNDAMENTAL INVESTIGATION OF STRESS CORROSION CRACKING Final Report, 1 Jul. 1971 - 30 Apr. 1972
T. R. Beck, M. J. Blackburn, and W. H. Smyrl 30 Apr. 1972 88 p refs
(Contract NASw-2245)
(NASA-CR-127726; D180-15006-1) Avail: NTIS HC $6.50 CSCL 20K

Two principle areas studied were stress corrosion crack growth rates of a titanium alloy in liquid environments containing halide ions and pitting corrosion of titanium in bromide solutions. Two initial assumptions were made, that the rate of propagation was controlled by a macroscopic solution parameter and that this parameter was viscosity. A series of solutions were prepared using lithium chloride as the solute and water, methanol, glycerin, formic acid, acetone, dimethyl sulphoxide, etc. As solvents, these solutions were prepared with a 5:1 solvent-solute ratio. Viscosity was varied by changing the temperature and it was found: (1) In all solvents the velocity of cracking was proportional to the reciprocal of the viscosity. (2) Each solvent gave a separate relationship, (3) The temperature dependence and numerical values for the apparent activation energy of cracking and viscosity were the same. Author

N72-28897# Aeronautical Research Labs., Melbourne (Australia).
SIMPLE THEORETICAL STUDIES OF FATIGUE CRACK PROPAGATION USING A FRACTURE MECHANICS APPROACH
B. C. Hoskin Dec. 1971 34 p refs
(ARL/SM-Note-372) Avail: NTIS HC $3.75

Using simple illustrative examples, several aspects of fracture mechanics laws for fatigue crack propagation are discussed. Topics covered include: (1) the application of three such laws in cases of constant amplitude fatigue loadings, (2) the use of such laws in estimating safe operating periods for potentially cracked structures which are proof tested before entering service, (3) a comparison between this crack growth approach to fatigue life and the cumulative damage approach (Miner's hypothesis), and (4) a study of a proposed crack propagation law which incorporates a so-called spectrum retardation effect, an effect wherein the occurrence of a high tensile load in a fatigue spectrum can retard subsequent crack growth. Author

N72-28898# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugzeugbau.
THE APPLICATION OF THE RAYLEIGH-RITZ METHOD WITH MESHWISE INTERPOLATION TO CALCULATING THE BUCKLING LOADS OF SHALLOW SANDWICH SHELLS
Bodo Geier 1972 106 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-05) Avail: NTIS HC $7.50; DFVLR Porz-Wahn: 22.50 DM

The determination of stability limits for shallow shells of sandwich construction is formulated as a variational problem. The facings of the sandwich are allowed to be eccentrically orthotropic elastic shells, and for the core orthotropic material properties are assumed as well. A method transforming the variational problem into an approximately equivalent algebraic eigenvalue problem is then described. It is a modified Rayleigh-Ritz procedure utilizing interpolation over rectangular subregions by bicubic polynomials. The approximation is such that geometric compatibility is completely satisfied. For the resulting linear algebraic problem a prescribed number of eigenvalues at the lower end of the spectrum together with the corresponding eigenvectors, are found by simultaneous iteration. Several examples are given in order to check the procedure by comparing the results with known exact solutions, and to illustrate the types of problems to be treated by the method. Author

N72-28899*# Lockheed-Georgia Co., Marietta.
RESIDUAL STRENGTH AND CRACK PROPAGATION TESTS ON C-130 AIRPLANE CENTER WINGS WITH SERVICE-IMPOSED FATIGUE DAMAGE
H. Lawrence Snider, Franklin L. Reeder, and William Dirkin Washington NASA Jul. 1972 67 p ref
(Contract NAS1-9485)
(NASA-CR-2075; ER-11178) Avail: NTIS HC $3.00 CSCL 20K

Fourteen C-130 airplane center wings, each containing service-imposed fatigue damage resulting from 4000 to 13,000 accumulated flight hours, were tested to determine their fatigue crack propagation and static residual strength characteristics. Eight wings were subjected to a two-step constant amplitude fatigue test prior to static testing. Cracks up to 30 inches long were generated in these tests. Residual static strengths of these wings ranged from 56 to 87 percent of limit load. The remaining six wings containing cracks up to 4 inches long were statically tested as received from field service. Residual static strengths of these wings ranged from 98 to 117 percent of limit load. Damage-tolerant structural design features such as fastener holes, stringers, doublers around door cutouts, and spanwise panel splices proved to be effective in retarding crack propagation. Author

N72-28900# National Bureau of Standards, Washington, D.C. Building Research Div.
PAPER HONEYCOMB SANDWICH PANELS AS LIGHT-WEIGHT STRUCTURAL COMPONENTS Interim Report, Nov. 1970 - Apr. 1971
Thomas W. Reichard Apr. 1972 10 p refs
(NBS Proj. 4215424)
(NBS-BSS-43; LC-71-190625) Avail: SOD HC $0.25 as C 13.29/2:43

Current practice in the U.S. with regard to the use of sandwich panels in single-story buildings is discussed. Descriptions and properties of typical paper honeycomb cores are given.

Some of the factors which are considered in choosing sandwich facings and adhesives are given. Author

N72-28901*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
VIBRATION MANUAL
Claude Green 1 Dec. 1971 592 p refs
(NASA-TM-X-64669) Avail: NTIS HC $30.75 CSCL 20K

Guidelines of the methods and applications used in vibration technology at the MSFC are presented. The purpose of the guidelines is to provide a practical tool for coordination and understanding between industry and government groups concerned with vibration of systems and equipments. Topics covered include measuring, reducing, analyzing, and methods for obtaining simulated environments and formulating vibration specifications. Methods for vibration and shock testing, theoretical aspects of data processing, vibration response analysis, and techniques of designing for vibration are also presented. Author

N72-28902# Rolls-Royce, Ltd., Wateford (England). Small Engine Div.
THE INFLUENCE OF FRETTING ON FATIGUE, PART 3
W. J. Harris Paris AGARD Jun. 1972 25 p
(AGARD-AR-45) Avail: NTIS HC $3.25

The effects of fretting on the fatigue properties of various materials are discussed. The development and evaluation of anti-fret media on titanium and aluminum alloys is described. The laboratory equipment used to conduct the experiments is illustrated. Tables and graphs are included to portray the results of the experiments. P.N.F.

N72-28903# Aeronautical Research Labs., Melbourne (Australia).
THE INTERPRETATION OF THE SCATTER FACTOR
Feb. 1972 17 p refs
(ARL/SM-Note-373) Avail: NTIS HC $3.00

The application of scatter factors for determining aircraft fatigue life is discussed. Examples of national practices in scatter factor application are presented. A table of scatter factors for aircraft of Australia, U.S., and France is included. Author

N72-28904# National Research Council of Canada, Ottawa (Ontario).
EXPERIMENTAL STUDY OF THE ULTIMATE STRENGTH OF COMPOSITE BEAMS SUBJECTED TO ALTERNATE LOADING OF POSITIVE AND NEGATIVE BENDING
H. Makino, M. Hirosawa, S. Tabata, T. Takada, and J. Maki 1972 6 p ref Transl. into ENGLISH from Proc. of the Japan Soc. of Architectural Eng., v. 42, no. 10, 1967 p 478
(NRC-TT-1557) Avail: NTIS HC $3.00

Composite beams composing a frame subjected to positive and negative bending moments are discussed. The ultimate strength of these beams when subjected to alternate loading of positive and negative bending is presented. The cross sections of the specimens were a concrete T-beam combined with an H-shaped steel girder. Welded studs were used as shear connectors. The relationships between the loads and the deflections at the center of the span of each of the two experimental beams having the same cross section, span length, and material properties are examined. Author

N72-28905*# Southwest Research Inst., San Antonio, Tex. Dept. of Mechanical sciences.
COUPLING BETWEEN STRUCTURE AND LIQUIDS IN A PARALLEL STAGE SPACE SHUTTLE DESIGN
D. D. Kana, W. L. Ko, P. H. Francis, and A. Nagy 5 Jul. 1972 18 p refs Revised Backup document for AIAA Synoptic scheduled for publication in Journal of Spacecraft and Rockets in Nov. 1972
(Contract NAS1-9890)
(NASA-CR-127631; AIAA-Paper-72-347-Rev) Avail: NTIS HC $3.00 CSCL 22B

A study was conducted to determine the influence of liquid propellants on the dynamic loads for space shuttle vehicles. A parallel-stage configuration model was designed and tested to determine the influence of liquid propellants on coupled natural modes. A forty degree-of-freedom analytical model was also developed for predicting these modes. Currently available analytical models were used to represent the liquid contributions, even though coupled longitudinal and lateral motions are present in such a complex structure. Agreement between the results was found in the lower few modes. Author

N72-28906*# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
AN INTEGRAL EQUATION APPROACH TO THE STRIP PROBLEM
G. D. Gupta Jun. 1972 27 p refs
(Grants NGR-39-007-011; NSF GK-11977)
(NASA-CR-127685; NASA-TR-72-5; IFSM-72-20) Avail: NTIS HC $3.50 CSCL 20K

A semi-infinite strip held rigidly on its short end is considered. Loads in the strip at infinity (far away from the fixed end) are prescribed. Integral transform technique is used to provide an exact formulation of the problem in terms of a singular integral equation. Stress singularity at the strip corner is obtained from the singular integral equation which is then solved numerically. Stresses along the rigid end are determined and the effect of the material properties on the stress intensity factor is presented. The method can also be applied to the problem of a laminate composite with a flat inclusion normal to the interfaces. Author

N72-28907*# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
NASTRAN: USER EXPERIENCE WITH FOUR EXAMPLE PROBLEMS
R. M. Rivello Apr. 1972 139 p refs Supported in part by NASA
(Contract N00017-72-C-4401)
(NASA-CR-127681; TG-1196) Avail: NTIS HC $9.00 CSCL 20K

Four different structural problems are solved to gain familiarity with the NASTRAN computer program. The problems are: (1) a simply-supported beam subjected to lateral loads, (2) a rotating filamentary composite bar under the action of centrifugal forces, (3) a missile body with aerodynamic, gravitational, and inertial forces, and (4) a square simply-supported plate with in-plane temperature changes capable of buckling the plate. Input and output data are given for each problem. The results are compared with those obtained by other methods. However, except for the examples employing beam elements in which the agreement is excellent, the element breakup chosen for convenience in obtaining program familiarity is too coarse to draw conclusions regarding the program accuracy. The example problems disclosed errors in the plotting and thermal-buckling routines of the program. Author

N72-28908# Laboratoriqm fur Betriebsfestigkeit, Darmstadt (West Germany).
OPTIMIZATION OF THE BOLTED JOINT WING LOWER SURFACE-WING BODY FITTING OF A MILITARY AIRCRAFT [OPTIMIERUNG DER VERSCHRAUBTEN FUEGUNG ZWISCHEN FLUEGELUNTERDECKE UND ANSCHLUSSBESCHLAG EINES MILITAERFLUGZEUGES]
D. Schuetz and O. Goekgoel (Hamburger Flugzeugbau) 1971 172 p refs In GERMAN; ENGLISH summary Prepared jointly with Hamburger Flugzeugbau
(TB-95) Avail: NTIS HC $10.75

The fatigue strength of a joint wing lower surface-body wing fitting was optimized by manufacturing measures. With applied optimal measures variable amplitude fatigue tests exhibit an increase in fatigue life by a factor of 5 for the wing lower surface in the joint area and by a factor of 25 for the fitting. Factors 5 and 25 are related to the fatigue life resulting from conventional processing methods. Author (ESRO)

N72-28909# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
APPLICABILITY OF THE SOUTHWELL PLOT TO THE INTERPRETATION OF TEST DATA OBTAINED FROM STABILITY STUDIES OF ELASTIC COLUMN AND PLATE STRUCTURES
W. H. Horton, F. L. Cundari, and R. W. Johnson Nov. 1971 132 p refs Revised
(Contract DA-44-177-AMC-258(T); DA Proj. 1F1-62204-A-170)
(AD-739967; SUDAAR-296; USAAVLABS-TR-69-32) Avail: NTIS CSCL 20/11

Thomas Young derived in 1807 a formula which associated the applied load, the Euler critical load, the initial bow, and the elastic deformation under load for a column. Westergaard in 1922 used the Lagrangian law to derive Young's expression in a much wider context, and in so doing demonstrated its general validity in all linear instability problems. This relationship has great significance in the correlation of experimental data with linear theory. This was realized first by Ayrton and Perry in 1887. In 1932 Southwell independently redeveloped the technique and used it to discuss the classic column tests of von Karman. This report coordinates and extends the research made in this field during the last century and a half. It demonstrates the power and versatility of the method of expressing the given hyperbolic equation in a linear form - by change of variables and determining the classic critical load as the slope of this line.
Author (GRA)

N72-28910# Massachusetts Inst. of Tech., Cambridge.
ELASTIC CRACK ANALYSIS BY A FINITE ELEMENT HYBRID METHOD
T. H. H. Pain, P. Tong, and C. H. Luk Dec. 1971 22 p refs
(Contract F44620-67-C-0019)
(AD-739988; AFOSR-72-0752TR) Avail: NTIS CSCL 20/11

The paper presents an efficient finite element method for evaluating the elastic stress intensity factors at the tip of a sharp crack. The method is based on a hybrid stress model for which special stress terms which represent the correct singularity behavior at the crack tip can be included. The magnitudes of such singular terms which are among the unknowns of the final matrix equations are, in fact, the stress intensity factors to be evaluated. Example solutions include plane stress cracks of both the opening type and in-plane shear type for isotropic materials and of the opening type for anisotropic materials. Author (GRA)

N72-28911# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
THE EFFECT OF TEST MACHINE EXTENSIONAL RIGIDITY OF THE INITIAL BUCKLING LOAD OF UNREINFORCED CIRCULAR CYLINDRICAL SHELLS IN AXIAL COMPRESSION
Stanley C. Bailey and Wilfred H. Horton Nov. 1971 70 p refs Revised
(Contract DA-44-177-AMC-115(T); DA Proj. 1F1-62202-A-170)
(AD-738214; SUDAAR-298-Rev; USAAVLABS-TR-69-62-Rev)
Avail: NTIS CSCL 13/13

The inadequacy of small displacement theory of thin shells in explaining the buckling of circular cylindrical shells has been established. Likewise, it has become general belief that an explanation can be given by means of a nonlinear large deflection theory. The current theories lean heavily upon a plausible but arbitrarily chosen energy criterion first given by Tsien, and predict that the initial buckling load should be influenced by the testing machine stiffness. Two experiments described, statistically analyzed, and discussed by the authors in a previous paper revealed that test machine extensional rigidity does not influence the initial failing load. These results were obtained from repeated tests on a single near-perfect aluminum specimen and individual tests on many less perfect steel shells. They had R/t ratios of 313 and 226, respectively, and buckled at 77 and 45 percent of the classical critical load. Author (GRA)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory.
For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N72-28912 National Lending Library for Science and Technology, Boston Spa (England).
INVESTIGATION OF HEAT TRANSFER BETWEEN GAS AND SOLID PARTICLES IN A FLUIDIZED BED
Ya. Tsiborovskii and Ya. Roshak Jun. 1972 8 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (Moscow), v. 2, no. 2, 1959 p 3-9
(NLL-RTS-7326) Avail: Natl. Lending Library, Boston Spa, Engl.: £0.80 and 3 NLL photocopy coupons

A nonsteady heat state method was used in the determination of the heat transfer coefficient between air and sand in a fluidized bed. It was found that the value of heat transfer coefficient increases with increase in particle size and is unaffected by air velocity. Author

N72-28913*# General Electric Co., Philadelphia, Pa.
LONG LIFE HIGH RELIABILITY THERMAL CONTROL SYSTEMS STUDY DATA HANDBOOK
T. R. Scollon, Jr. and M. J. Carpitella Dec. 1971 98 p refs
(Contract NAS8-26252)
(NASA-CR-123734) Avail: NTIS HC $7.00 CSCL 11C

The development of thermal control systems with high reliability and long service life is discussed. Various passive and semi-active thermal control systems which have been installed on space vehicles are described. The properties of the various coatings are presented in tabular form. Author

N72-28914*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
PRACTICAL APPLICATION OF COMPUTER PROGRAMS FOR SUPERSONIC COMBUSTION
Frank R. Groves, Jr. Jun. 1972 56 p refs
(Contract NAS1-10341)
(NASA-CR-112029) Avail: NTIS HC $5.00 CSCL 20M

Experimental data were interpreted using two supersonic combustion computer programs. The P1 program is based on a conventional boundary layer treatment of the mixing of concentric gas streams and complete combustion chemistry. The H1 program is based on a modified boundary layer approach which accounts for radial pressure gradients in the flow and also incorporates a finite rate chemistry calculation. The objective of the investigation was to compare the experimental data with theoretical predictions of the two programs with special emphasis on the prediction of radial pressure gradients by the H1 program. A test of the H1 program was also desired through comparison with the experimental data and with the P1 program. Author

N72-28915# Laboratoire d'Automatique et de Ses Applications Spatiales, Toulouse (France).
STUDY OF A SYSTEM FOR REGULATING TEMPERATURE IN A WEAK OSCILLATING BOUNDARY Ph.D. Thesis [ETUDE D'UN SYSTEME DE REGULATION DE TEMPERATURE PAR TOUT OU RIEN A FAIBLE OSCILLATION LIMITE]
Henri Donnarel 4 Feb. 1972 170 p refs In FRENCH
Avail: NTIS HC $10.50

A temperature regulating mechanism for the weak oscillating boundary of a unit pilot catalytic reactor is analyzed. Data cover possible ways of minimizing oscillations in cyclic limit amplitudes, problems of heat transmission, and the advantages of the system over previous ones. Transl. by E.H.W.

N72-28916# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
MEASUREMENT OF THE RADIATION FLUX AT THE IGNITION OF SOLID PROPELLANTS
Jean Crabol 1972 10 p refs In FRENCH Presented at the 4th Natl. Calorimetry Meeting of the French Soc. of Thermal Physicists, Paris, 4-5 May 1972
(ONERA-TP-1067) Avail: NTIS HC $3.00

A description is given of a sensor designed to measure the radiating and convective energy of ignited solid propellants. The sensor is reliable, inexpensive, and has a very short response time. Author

N72-28917*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
THERMOPHYSICAL PROPERTIES OF PARAHYDROGEN FROM THE FREEZING LIQUID LINE TO 5000 R FOR PRESSURES TO 10000 PSIA
Robert D. McCarty and Lloyd A. Weber Apr. 1972 169 p refs
(NASA Order T-1813-A; NASA Order W-13353)
(NASA-CR-127701; NBS-TN-617) Avail: NTIS; SOD $1.50 as C13.46:617 CSCL 20M

The tables include entropy, enthalpy, internal energy, density, volume, speed of sound, specific heat, thermal conductivity, viscosity, thermal diffusivity, Prandtl number, and the dielectric constant for 65 isobars. Quantities of special utility in heat transfer and thermodynamic calculations are also included in the isobaric tables. In addition to the isobaric tables, tables for the saturated vapor and liquid are given, which include all of the above properties, plus the surface tension. Tables for the P-T of the freezing liquid, index of refraction, and the derived Joule-Thomson inversion curve are also presented. Author

N72-28918*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
EVALUATION OF ELECTROEXPLOSIVE DEVICES BY NONDESTRUCTIVE TEST TECHNIQUES AND IMPULSIVE WAVEFORM FIRINGS
V. J. Menichelli 15 Jun. 1972 25 p refs
(Contract NAS7-100)
(NASA-CR-127451; JPL-TR-32-1556) Avail: NTIS HC $3.25 CSCL 19A

Nondestructive test techniques and instrumentation for I-W/I-A no-fire devices have been developed. Several lots of squibs have been evaluated using these techniques and instrumentation. They yield data as to the quality and normal behavior of each electroexplosive device without firing or degrading the unit. Performance data were obtained by initiating the EED's with an impulsive waveform and sensing the initiation characteristics, sensitivity, and output. Author

N72-28919*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF HEAT-TRANSFER TEST DATA FOR A CHORDWISE-FINNED, IMPINGEMENT-COOLED TURBINE VANE TESTED IN A FOUR-VANE CASCADE AND A RESEARCH ENGINE
Herbert J. Gladden and Frederick C. Yeh Jul. 1972 38 p refs
(NASA-TM-X-2595; E-6870) Avail: NTIS HC $3.00 CSCL 20M

The heat-transfer characteristics of a chordwise-finned, impingement-cooled vane were investigated in both a modified J-57 research engine and a four-vane cascade. The data were compared by a correlation of temperature difference ratio with coolant- to gas-flow ratio and also by two modifications of this correlation. The results indicated that the cascade vane temperature data can generally be used to represent the engine vane temperature data. A discussion of engine and cascade gas-side heat-transfer coefficients is also presented. A redesign of the vane leading edge could significantly increase the potential turbine-inlet temperature operating limit. Author

N72-28920*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN OUT-OF-CORE VERSION OF A SIX CELL HEAT-PIPE HEATED THERMIONIC CONVERTER ARRAY
Erich W. Kroeger, James J. Ward, and Roland Breitwieser 1972 16 p refs Proposed for presentation at 7th Intersoc. Energy Conversion Eng. Conf., San Diego, Calif., 25-29 Sep. 1972; Sponsored by the Am. Chem. Soc.
(NASA-TM-X-68116) Avail: NTIS HC $3.00 CSCL 20M

A thermionic system concept is described which incorporates a heat-pipe cooled fast spectrum reactor and six-cell thermionic converter modules located in the space radiator. Much of the technology being developed for the in-core thermionic reactor concept is directly applicable to this out-of-core concept, particularly the fuel and converter development activity. The major technology extension required is in the area of heat-pipes for cooling the reactor and carrying thermal energy from the reactor station to the converters. The performance characteristics of an out-of-core thermionic system at power levels between 40 and 70 kWe are summarized, the adaptation of in-core technology to the out-of-core concept is described and applicable heat-pipe technology programs now underway are discussed. Author

N72-28921*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
NONLINEAR LEAST SQUARES - AN AID TO THERMAL PROPERTY DETERMINATION
D. M. Curry and S. D. Williams Jun. 1972 18 p refs
(NASA-TM-X-58092; MSC-07048) Avail: NTIS HC $3.00 CSCL 20M

Nonlinear least squares techniques can be used to determine effective thermal conductivity values from experimental data. Comparisons between measured and predicted conductivity values indicate that the analytically determined values can be used with confidence in performing thermal protection system analyses. A study was performed to compare the relative efficiencies of different minimizing techniques; techniques; the method of Peckham was the most efficient. Author

N72-28922*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
POLYNOMIAL APPROXIMATIONS OF THERMODYNAMIC PROPERTIES OF ARBITRARY GAS MIXTURES OVER WIDE PRESSURE AND DENSITY RANGES
Dennis O. Allison Washington Aug. 1972 34 p refs
(NASA-TN-D-6862; L-8297) Avail: NTIS HC $3.00 CSCL 20M

Computer programs for flow fields around planetary entry vehicles require real-gas equilibrium thermodynamic properties in a simple form which can be evaluated quickly. To fill this need, polynomial approximations were found for thermodynamic properties of air and model planetary atmospheres. A coefficient-averaging technique was used for curve fitting in lieu of the usual least-squares method. The polynomials consist of terms up to the ninth degree in each of two variables (essentially pressure and density) including all cross terms. Four of these polynomials can be joined to cover, for example, a range of about 1000 to 11000 K and 0.00001 to 1 atmosphere (1 atm = 1.0133 x 100,000 N/m sq) for a given thermodynamic property. Relative errors of less than 1 percent are found over most of the applicable range. Author

N72-28923*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ELECTROSTATICALLY CONTROLLED HEAT SHUTTER
Patent Application
Lloyd J. Derr, inventor (to NASA) Filed 28 Jun. 1972 11 p
(Contract NAS7-100)
(NASA-Case-NPO-11942-1; US-Patent-Appl-SN-266866) Avail: NTIS HC $3.00 CSCL 20M

A heat transfer assembly for conducting thermal energy includes a hermetically sealed container enclosing a quantity of inert gas, such as nitrogen. Two opposed walls of the container

have high thermal conducting characteristics, while the connecting walls have low thermal conducting characteristics. Electrodes are positioned adjacent to the highly thermal conducting walls and biased, relative to the conducting walls, to a corona potential for creating an ionic gas wind which must contact the conducting walls to be neutralized. The contact of the gas molecules permits the maximum thermal energy transfer between the walls. Baffles can be positioned adjacent to the electrodes to regulate gas flow between the highly thermal conducting surfaces. NASA

N72-28924# City Coll. Research Foundation, New York.
INVESTIGATIONS CONCERNING HEAT TRANSFER INVOLVING CONICAL STRUCTURES
Fritz Oberhettinger and Robert F. Dressler May 1971 17 p refs Submitted for publication
(Grant NSF GP-24619)
(Rept-71-466-04) Avail: NTIS HC $3.00

The temperature field inside a region consisting of two coaxial finite circular cones was investigated. Both the isothermic and the adiabatic case are considered, and the temperature distribution is assumed to be of rotational symmetry with respect to the axis. Author

N72-28925*# Naval Weapons Center, China Lake, Calif. Research Dept.
BERYLLIUM PARTICLE COMBUSTION Final Report
Jack L. Prentice Jun. 1972 82 p refs Sponsored in part by NASA
(NASA-CR-127722; NWC-TP-5330) Avail: NTIS HC $6.25 CSCL 21B

A two-year study of the combustion efficiency of single beryllium droplets burning in a variety of oxidizers (primarily mixtures of oxygen/argon and oxygen/nitrogen) is summarized. An advanced laser heating technique was used to acquire systematic quantitative data on the burning of single beryllium droplets at atmospheric pressure. The research confirmed the sensitivity of beryllium droplet combustion to the chemistry of environmental species and provides experimental documentation for the nitrogen-induced droplet fragmentation of burning beryllium droplets. Author

N72-28926*# New York Univ., N.Y. Aerospace Lab.
HEAT TRANSFER DISTRIBUTION ON A DISCONTINUOUSLY CONVECTIVE COOLED SURFACE
Renzo Piva (Rome Univ.) and Richard Poch [1972] 44 p refs
(Grant NGR-33-016-131)
(NASA-CR-112047) Avail: NTIS HC $4.25 CSCL 20M

An active cooling scheme in which discrete cooling passages are used was investigated. In this scheme, the coolant passages are placed perpendicular to the main stream direction. Streamwise temperature oscillations result from the highly cooled regions, near the coolant channels, being next to regions not directly cooled beteween the channels. The accuracy of the heat transfer rate predictions by these approximations was evaluated by means of both experimental and numerical investigations. Experiments were conducted at free stream Mach number of 6 with several cooling passages. Heat transfer measurements were made and corresponding theoretical analysis were performed for comparison in evaluating both local and overall deviations in the heat transfer rate. Author

N72-28927# Technische Hochschule Munchen (West Germany). Fakultaet fuer Maschinenwesen und Elektrotechnik.
ON THE LAYOUT OF HEAVY DUTY GILLED-TUBE RADIATORS Ph.D. Thesis [ZUR AUSLEGUNG LEISTUNGSSTARKER RIPPENROHRRADIATOREN]
Juergen Blumenberg Oct. 1971 20 p refs In GERMAN
Avail: NTIS HC $3.00

Liquid metal finned-tube radiators and heat pipe radiators for thermal space power reactors are evaluated for their meteoroid safety, segmentation and redundance properties. Thermodynamic models are formulated and used to calculate optimal performance characteristics for the corresponding weight/mass ratios. Transl. by G.G.

N72-28928*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TECHNIQUES ASSOCIATED WITH THERMAL-VACUUM TESTING OF THE OAO C HEAT PIPES
James P. Marshburn Washington Aug. 1972 10 p ref
(NASA-TN-D-6875; G-1065) Avail: NTIS HC $3.00 CSCL 20M

The mechanical problems associated with the testing of two heat pipes installed in the OAO C spacecraft are described. The test problems discussed concern the specially designed heat removal devices, the mobile tilt table, the table position indicator, and the heat input machanisms. It was determined that the techniques used were adequate for thermal-vacuum testing of heat pipes. Author

N72-28929# Ernst-Mach-Inst., Freiburg (West Germany).
MICROSTRUCTURE OF GASEOUS DETONATION WAVES [MIKROSTRUKTUR DER DETONATIONSWELLEN IN GASEN]
F. Schultz-Grunow Aug. 1971 51 p refs In GERMAN
(Rept-6/71) Avail: NTIS HC $4.75

A model of Mach wave induced reactions with multiple centers is presented. The regular structures that appear in gas detonation waves have led to several reflections which are too specific to be used for interpretation of all phenomena. The reaction centers are destroyed by pressure waves, and Mach waves are formed. The model is shown to be in agreement with experimental results. The Chapman-Jouguet theory remains valid, but not the representation of homogeneous reaction layers on which it is based. ESRO

N72-28930# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
NOZZLE BEAM-MASS SPECTROMETER SYSTEM FOR STUDYING ONE-ATMOSPHERIC FLAMES Technical Report, Jul. 1971 - Jun. 1972
Berge B. Goshgarian and Wayne C Solomon Apr. 1972 35 p refs
(AF Proj. 644)
(AD-739883; AFRPL-TR-72-30) Avail: NTIS CSCL 21/2

A nozzle beam-mass spectrometer system for sampling one-atmosphere flames has been constructed. The design details of the device are presented. The performance of the device in sampling premixed flames is demonstrated using methane-oxygen-argon flames. Near-equilibrium flame conditions are observed. The concentration of combustion products has been measured and certain combustion intermediates have been observed while translating the probe through the flame zones. Spatial resolution within the flame zones is found to be good, the latter being on the order of 0.1 mm. Author (GRA)

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N72-28931*# Stanford Research Inst., Menlo Park, Calif.
ACTIVITIES OF THE NASA SPONSORED SRI TECHNOLOGY APPLICATIONS TEAM IN TRANSFERRING AEROSPACE TECHNOLOGY TO THE PUBLIC SECTOR Annual Report, 1 Jul. 1970 - 30 Jun. 1971
Joseph G. Berke Jul. 1971 113 p refs
(Contract NASw-1992; SRI Proj. PYU-8368)
(NASA-CR-127453) Avail: NTIS HC $7.75 CSCL 05B

The organization and functions of an interdisciplinary team for the application of aerospace generated technology to the solution of discrete technological problems within the public sector are presented. The interdisciplinary group formed at Stanford Research Institute, California is discussed. The functions of the group are to develop and conduct a program not only optimizing the match between public sector technological problems in criminalistics, transportation, and the postal services and potential solutions found in the aerospace data base, but ensuring that appropriate solutions are acutally utilized. The work accomplished during the period from July 1, 1970 to June 30, 1971 is reported. Author

N72-28932*# University of Southern Calif., Los Angeles. Western Research Application Center.
ACTIVITIES OF WESTERN RESEARCH APPLICATION CENTER Annual Report
31 Jan. 1972 94 p
(Contract NASw-1869)
(NASA-CR-127565) Avail: NTIS HC $6.75 CSCL 05A

Operations of the regional dissemination center for NASA technology collection and information transfer are reported. Activities include customized searches for engineering and scientific applications in industry and technology transfers to businesses engaged in manufacturing high energy physics devices, subsurface instruments, batteries, medical instrumentation, and hydraulic equipment. G.G.

N72-28933*# Stanford Research Inst., Menlo Park, Calif.
TRANSFER OF AEROSPACE TECHNOLOGY TO SELECTED PUBLIC SECTOR AREAS OF CONCERN Semiannual Report, 1 Jul. - 31 Dec. 1971
Joseph G. Berke Jan. 1972 48 p refs
(Contract NASw-1992; SRI Proj. PYU-8368)
(NASA-CR-127438; SAR-2) Avail: NTIS HC $4.50 CSCL 05B

The activities of the NASA Technology Applications Team at Stanford Research Institute, California are discussed. The specific activities in the fields of criminalistics and transportation are reported. The overall objectives of the program are stated on the basis of successful technology transfer and providing appropriate visibility for program activities. Author

N72-28934*# Southeastern State Coll., Durant, Okla. Technology Use Studies Center.
TECHNOLOGY UTILIZATION IN A NON-URBAN REGION: FURTHER IMPACT AND TECHNIQUE OF THE TECHNOLOGY USE STUDIES CENTER (3) Final Report
C. Henry Gold, A. M. Moore, Bill Dodd, comp., and Velma Dittmar, comp. May 1972 75 p refs
(Contract NSR-37-004-009)
(NASA-CR-127437; AR-8) Avail: NTIS HC $5.75 CSCL 05B

The activities of the Technology Utilization Center are reported. Data concerning the searches, and the types of firms requesting information are presented along with the dissemination and assistance by TUSC. F.O.S.

N72-28935*# North Carolina Science and Technology Research Center, Durham.
REGIONAL TECHNOLOGY TRANSFER PROGRAM Final Report, 1 Nov. 1970 - 31 Oct. 1971
31 Oct. 1971 70 p
(Contract NASw-2051)
(NASA-CR-124825) Avail: NTIS HC $5.50 CSCL 05B

The continuing operation is reported of a jointly state- and NASA-sponsored Regional Dissemination Center serving the southeastern United States. The NC/STRC offers automated searching of large information collections, such as that assembled by NASA, with emphasis on textile-related files to serve regional industry. During this period, NC/STRC conducted an in-depth analysis of its marketing programs and prepared a series of brochures aimed at various segments of industry. Heavy emphasis was also placed on the Library Search Service inaugurated by NC/STRC, and a total of 32 universities now participate in this service. Smaller schools are served through the university network. Although the nationwide industrial recession caused a general drop in search requests, NC/STRC processed a total of 838 retrospective searches during this period: 39.97% for its industrial clients, 22.9% for university libraries, and 37.1% for other RDC's. Author

N72-28936*# Clingman (W. H.) and Co., Dallas, Tex.
INDEXING NASA PROGRAMS FOR TECHNOLOGY TRANSFER METHODS DEVELOPMENT AND FEASIBILITY Final Report
William H. Clingman 29 May 1972 94 p
(NASw-2368)
(NASA-CR-127465) Avail: NTIS HC $6.75 CSCL 05B

This project was undertaken to evaluate the application of a previously developed indexing methodology to ongoing NASA programs. These programs are comprehended by the NASA Program Approval Documents (PADS). Each PAD contains a technical plan for the area it covers. It was proposed that these could be used to generate an index to the complete NASA program. To test this hypothesis two PADS were selected by the NASA Technology Utilization Office for trial indexing. Twenty-five individuals indexed the two PADS using NASA Thesaurus terms. The results demonstrated the feasibility of indexing ongoing NASA programs using PADS as the source of information. The same indexing methodology could be applied to other documents containing a brief description of the technical plan. Results of this project showed that over 85% of the concepts in the technology should be covered by the indexing. Also over 85% of the descriptors chosen would be accurate. This completeness and accuracy for the indexing is considered satisfactory for application in technology transfer. Author

N72-28937# Max-Planck-Institut fuer Stromungsforschung, Gottingen (West Germany).
BIBLIOGRAPHY OF PUBLICATIONS, 1960 - 1970 AND SUPPLEMENT TO BIBLIOGRAPHY OF PUBLICATIONS, 1907 - 1959 [BIBLIOGRAPHIE DER VEROEFFENTLICHUNGEN 1960-1970 UND NACHTRAG ZU BIBLIOGRAPHIE DER VEROEFFENTLICHUNGEN 1907-1959]
1971 122 p refs In GERMAN
(Rept-50) Avail: NTIS HC $8.25

This enlarged bibliography contains 1056 citations on hydrodynamic and aerodynamic literature from the period 1960 through 1970 in addition to a supplementary review of 1907 through 1959 publications. Transl. by G.G.

N72-28938# Nauka Press, Moscow (USSR).
PLANNING AND CONTROL OF SCIENTIFIC RESEARCH
K. L. Gorman 1971 188 p refs In RUSSIAN
Avail: NTIS HC $11.50

Questions of working methodologies in flow planning, operational control, and evaluation of scientific research in the fields of organization are considered. Contemporary organizational structure, scientific planning, and its control are analyzed. Decision theory methods, their mathematical interpretation, and decision algorithms are presented. Transl. by K.P.D.

N72-28939# Nauka Press, Leningrad (USSR).
ADMINISTRATIVE ORGANIZATION OF SCIENTIFIC RESEARCH [ORGANIZATSIYA UPRAVLENIYA NAUCHNYMI ISSLEDOVANIYAMI]
K. A. Lange 1971 149 p refs In RUSSIAN
Avail: NTIS HC $9.50

Certain problems of contemporary organizational control of scientific investigations are considered. A possible variant for creating a control system for scientific experiments is presented, consisting of prediction nodes, planning, management, coordination, and control. Questions of the role of scientific information in the control system are discussed and the

significance of meetings for the control of scientific experiment in general is reviewed. The modern organization of scientific collectives and the activity of scientific unions in the Soviet Academy of Sciences as collective organs of scientific control are analyzed. Transl. by K.P.D.

N72-28940# Weapons Research Establishment, Salisbury (Australia).
[WEAPONS RESEARCH, DEVELOPMENT, AND ENGINEERING ACTIVITIES TRIAL RANGES] Annual Report, 1970-1971
1972 57 p refs
Avail: NTIS HC $5.00

Research, development and engineering tasks during 1970 centered on elements of modern weapon command and control systems, high altitude rocket and sounding projectile launchings, consulatation and services for technical developments, and various advanced technology and engineering techniques for modernizing weapon systems. The latter include a control system for anti-submarine mortar, plasma arc cutting equipment for metal plates, a transfer system for cryogenic cooling, production methods for wind tunnel nozzles and grooved steel balls, an underwater sound signal launcher, high speed cine-camera equipment for cardiovascular research, a variable wavelength optical filter, and airborne laser terrain surveying equipment. G.G.

N72-28941*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
JPL QUARTERLY TECHNICAL REVIEW, VOLUME 2, NO. 1, APRIL 1972
Apr. 1972 289 p refs
(Contract NAS7-100)
(NASA-CR-127471) Avail: NTIS HC $16.50 CSCL 05B

Research topics undertaken included lunar structure and evolution, solar protons, equipment for Mariner Venus-Mercury 1973 and Mars 1971 missions, propulsion systems and propellants, telemetry, surface vehicle steering control, and spacecraft tracking. For individual titles, see N72-28942 through N72-28956.

N72-28942* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A VIEW OF THE MOON **c30**
R. G. Brereton *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 1-11 refs (For availability see N72-28941 19-34)
CSCL 03B

The need for a task that would collate and interpret Apollo results and provide a synthesized view of the moon is discussed. Comparisons are made between earth and moon structure and history. Author

N72-28943* Boeing Co., Seattle, Wash.
MARINER VENUS-MERCURY 1973 MISSION SOLAR PROTON ENVIRONMENT: FLUENCE AND DOSE **c30**
J. R. Thomas *In* JPL JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 12-28 refs (For availability see N72-28941 19-34)
CSCL 03B

A derivation is presented for proton fluence over the duration of the Mariner Venus-Mercury 1973 (MVM73) mission in terms of a relatively constant, low energy component, the solar wind, and a probabilistic high energy component from discrete solar events. An updated correlation of yearly energetic proton fluence with yearly average sunspot number is presented. This correlation and sunspot cycle forecasts for the period of the MVM73 mission (late 1973 through early 1975) form the basis for the high energy proton fluence estimates with various confidence levels. Uncertainties in the probability estimates and in calculation of the scaling with distance from the Sun are discussed. Selection of a particular 95-percentile model as the design constraint is recommended, and reasons are presented for not using the worst-case model. Interior fluences were calculated and expressed in terms useful for spacecraft design. Author

N72-28944* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
JPL LITHIUM DOPED SOLAR CELL DEVELOPMENT PROGRAM **c03**
P. A. Berman *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 29-36 (For availability see N72-28941 19-34)
CSCL 10A

One of the most significant problems encountered in the use of silicon solar cells in space is the sensitivity of the device to electron and proton radiation exposure. The p-diffused-into-n-base solar cells were replaced with the more radiation tolerant n-diffused-into-p-base solar cells. Another advancement in achieving greater radiation tolerance was the discovery that the addition of lithium to n-base silicon resulted in what appeared to be annealing of radiation-induced defects. This phenomenon is being exploited to develop a high efficiency radiation resistant lithium-doped solar cell. Lithium-doped solar cells fabricated from oxygen-lean and oxygen-rich silicon were obtained with average initial efficiencies of 11.9% at air mass zero and 28 C, as compared to state-of-the-art n-p cells fabricated from 10 ohm cm silicon with average efficiencies of 11.3% under similar conditions. Lithium-doped cells demonstrated the ability to withstand three to five times the fluence of 1-MeV electrons before degrading to a power equivalent to state-of-the-art solar cells. The principal investigations are discussed with respect to fabrication of high efficiency radiation resistant lithium-doped cells, including starting material, p-n junction diffusion, lithium source introduction, and lithium diffusion. Author

N72-28945* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
METHODS FOR UTILIZING MAXIMUM POWER FROM A SOLAR ARRAY **c03**
D. K. Decker *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 37-48 refs (For availability see N72-28941 19-34)
CSCL 10A

A preliminary study of maximum power utilization methods was performed for an outer planet spacecraft using an ion thruster propulsion system and a solar array as the primary energy source. The problems which arise from operating the array at or near the maximum power point of its 1-V characteristic are discussed. Two closed loop system configurations which use extremum regulators to track the array's maximum power point are presented. Three open loop systems are presented that either: (1) measure the maximum power of each array section and compute the total array power, (2) utilize a reference array to predict the characteristics of the solar array, or (3) utilize impedance measurements to predict the maximum power utilization. The advantages and disadvantages of each system are discussed and recommendations for further development are made. Author

N72-28946* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
MARINER MARS 1971 SCAN PLATFORM POINTING CALIBRATION **c21**
G. D. Pace, F. I. Jaivin, and R. A. Virzi *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 49-57 refs (For availability see N72-28941 19-34)
CSCL 17G

A technique was devised for the Mariner Mars 1971 mission wherein both ground and in-flight calibrations were performed. A more analytical approach was used for ground calibration, and in-flight calibration was performed using narrow-angle television pictures of stars. The Mariner Mars 1971 calibration technique and results are summarized. Author

N72-28947* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
ANALYSIS OF MORGANTOWN VEHICLE STEERING CONTROL **c11**
H. S. Lin and E. L. Marsh *In its* JPL Quarterly Tech. Rev.,

Vol. 2, No. 1 Apr. 1972 p 58-71 ref (For availability see N72-28941 19-34)
CSCL 13F

The proposed Morgantown public transportation system will use a fleet of computer-controlled vehicles operating on a separate dedicated network of roadways called a guideway. An automatic steering system on each vehicle will permit the traversal of the proposed route of various guideway sections. A preliminary study was made to analyze the steering control for the Morgantown vehicles. The primary requirement was to design an automatic steering system that would achieve a smooth ride and eliminate the need for excess margin in the guideway width. Front and rear wheel steering and front and rear sensing capabilities were assumed in the analysis. The system finally adopted front and rear wheel steering and front sensing was shown by computer simulation and vehicle steering experiments to be adequate. Author

N72-28948* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
LIFETIME ESTIMATES FOR STERILIZABLE SILVER-ZINC BATTERY SEPARATORS c03
E. F. Cuddihy, D. E. Walmsley, and J. Moacanin *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 72-81 refs (For availability see N72-28941 19-34)
CSCL 10C

The lifetime of separator membranes currently employed in the electrolyte environment of silver-zinc batteries was estimated at 3 to 5 years. The separator membranes are crosslinked polyethylene film containing grafted poly (potassium acrylate) (PKA), the latter being the hydrophilic agent which promotes electrolyte ion transport. The lifetime was estimated by monitoring the rate of loss of PKA from the separators, caused by chemical attack of the electrolyte, and relating this loss rate to a known relationship between battery performance and PKA concentration in the separators. Author

N72-28949* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ANALYSIS OF THE FAILURE OF A POLYESTER PERIPHERAL DRIVE BELT ON THE MARINER MARS 1971 FLIGHT TAPE RECORDER c07
E. F. Cuddihy *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 82-99 ref (For availability see N72-28941 19-34)
CSCL 14C

A peripheral drive belt on the Mariner Mars 1971 tape recorder failed when a thin longitudinal strip separated off one edge. Analysis showed that the most probable cause of failure occurred from flexural fatigue initiating in mechanically weak locations which are introduced into the belt during fabrication. Methyl ethyl ketone, which is employed as a cleaning solvent during fabrication, was found to cause permanent reduction in engineering properties of polyester and could have contributed to the reduction of the fatigue resistance. Fatigue properties of the polyester drive belt are reviewed for the operating condition, as well as the sensitivity of polyester to cleaning solvents and the origin of mechanically weak locations. Author

N72-28950* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
STUDIES ON THE FRICTIONAL BEHAVIOR OF MAGNETIC RECORDING TAPES c07
S. H. Kalfayan, R. H. Silver, and J. K. Hoffman *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1. Apr. 1972 p 100-106 refs (For availability see N72-28941 19-34)
CSCL 14C

Methods were developed for measuring frictional forces acting on a magnetic tape in motion or at rest, as well as the extent of stick slip. The effects of factors such as temperature, humidity, kind of gaseous atmosphere, and tape speed on the frictional interaction between various tapes and heads were investigated. Results were instrumental in the selection of a tape for the Mariner Mars 1971 spacecraft. Studies are reported on the stick slip behavior of tapes and the performance of a metallic tape, compared with the usual plastic tapes. Author

N72-28951* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MINIMUM IMPULSE TESTS OF 0.45-N LIQUID HYDRAZINE CATALYTIC THRUSTERS c28
P. I. Moynihan *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 107-112 (For availability see N72-28941 19-34)
CSCL 21H

An exploratory test series was conducted on three types of 0.45-N (0.1 lbf) liquid hydrazine thrusters to ascertain the minimum impulse bit capability for this class of engine. The test series is described and the results are presented. The testing was performed at 21 and 145 C (70 and 300 F) while maintaining nominal 0.45 N (0.1 lbf) upstream conditions. Valve on-times as low as 0.008 sec were applied. Impulse bits were observed for thruster temperatures of 21 and 145 C (70 and 300 F), respectively. Author

N72-28952* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MARINER 9 PROPULSION SUBSYSTEM PERFORMANCE DURING INTERPLANETARY CRUISE AND MARS ORBIT INSERTION c28
M. J. Cork, R. L. French, C. J. Leising, and D. D. Schmit *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 113-122 refs (For availability see N72-28941 19-34)
CSCL 21H

On 14 November 1971 the Mariner 9 1334-N-(300-lbf)-thrust rocket engine was fired for just over 15 min to place the first man-made satellite into orbit about Mars. Propulsion subsystem data gathered during the 5-month interplanetary cruise and orbit insertion are of significance to future missions of this type. Specific results related to performance predictability, zero g heat transfer, and nitrogen permeation, diffusion, and solubility values are presented. Author

N72-28953* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SURFACE TENSIONS OF PROPELLANTS c27
R. Razouk *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 123-134 refs (For availability see N72-28941 19-34)
CSCL 21I

An apparatus is described for determining the surface tension of propellants by measuring the maximum bubble pressure using two capillaries of different bores. The innovation is the use of a pressure transducer coupled to a bridge supply and a strip chart recorder for registering the development of the pressure difference as the bubble is formed and released. This enables the measurements to be made under controlled atmospheres and to be remotely operated. Preliminary experiments were done on propellant-grade hydrazine and monomethylhydrazine, and on purified hydrazine, at temperatures between 275.4 and 353.2 K. Straight-line expressions and logarithmic expressions reproduce equally well the variation of surface tension with temperature. Contaminated hydrazine, pre-exposed to coupons of 6Al-4V titanium alloy for long periods, gives slightly higher values of surface tension. Author

N72-28954* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
OPERATING EXECUTIVE FOR THE DSIF TRACKING SUBSYSTEM SOFTWARE c08
P. L. Poulson *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 135-142 ref (For availability see N72-28941 19-34)
CSCL 09B

The advanced engineering model of the DSIF tracking subsystem (DTS) is being developed by the Deep Space Instrumentation Facility. The DTS will provide effective and reliable tracking and data acquisition support for the complex planetary and interplanetary space flight missions planned for the 1970's. The nucleus of the subsystem is a Honeywell H832 digital computer. The design and capabilities of the real-time operating executive software are described. Author

N72-28955* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
INTERPLEX: AN ANALYSIS OF OPTIMIZED POWER ALLOCATIONS FOR TWO AND THREE CHANNEL PSK/PM

TELECOMMUNICATIONS SYSTEMS c07
B. K. Levitt *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 143-151 refs (For availability see N72-28941 19-34)
CSCL 17B

Optimal design concepts are presented for two- and three-channel telemetry modes in the context of the Mariner Venus-Mercury 1973 mission and the usefulness of interplex modulation techniques is discussed. These ideas are applied as an example to one Mariner Venus-Mercury 1973 telemetry mode to demonstrate that interplex can reduce the required total average power by more than 2 dB in some cases. Author

N72-28956* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MINIATURE BIOTELEMETER GIVES MULTICHANNEL WIDEBAND BIOMEDICAL DATA c05
J. B. Carraway *In its* JPL Quarterly Tech. Rev., Vol. 2, No. 1 Apr. 1972 p 152-166 (For availability see N72-28941 19-34)
CSCL 06B

A miniature biotelemeter was developed for sensing and transmitting multiple channels of biomedical data over a radio link. The design of this miniature, 10-channel, wideband (5 kHz/channel), pulse amplitude modulation/ frequency modulation biotelemeter takes advantage of modern device technology (e.g., integrated circuit operational amplifiers, complementary symmetry/metal oxide semiconductor logic, and solid state switches) and hybrid packaging techniques. The telemeter is being used to monitor 10 channels of neuron firings from specific regions of the brain in rats implanted with chronic electrodes. Design, fabrication, and testing of an engineering model biotelemeter are described. Author

N72-28957# Committee on Armed Services (U. S. Senate).
FISCAL YEAR 1973 AUTHORIZATION FOR MILITARY PROCUREMENT, RESEARCH AND DEVELOPMENT, CONSTRUCTION AUTHORIZATION FOR THE SAFEGUARD ABM, AND ACTIVE DUTY AND SELECTED RESERVE STRENGTHS, PART 2
Washington GPO 1972 1062 p refs Hearings on S. 3108 before Comm. on Armed Serv., 92d Congr., 2d Sess., 15-17 and 22-24 Feb. 1972
Avail: Comm. on Armed Services

Hearing before the Committee on Armed Forces of the United States Senate during the ninety-second Congress are presented. The purpose of the hearings was to determine the fiscal year 1973 authorization for military procurement, research and development, construction authorization for Safeguard ABM, and active duty and selected reserve strengths. The document consists of testimony submitted by Defense Department witnesses and tabulated data to support the verbal statements. P.N.F.

N72-28958# Committee on Armed Services (U. S. Senate).
FISCAL YEAR 1973 AUTHORIZATION FOR MILITARY PROCUREMENT, RESEARCH AND DEVELOPMENT, CONSTRUCTION AUTHORIZATION FOR THE SAFEGUARD ABM, AND ACTIVE DUTY AND SELECTED RESERVE STRENGTHS, PART 3
Washington GPO 1972 962 p refs Hearings on S. 3108 before Comm. on Armed Serv., 92d Congr., 2d Sess., 28 Feb.; 2,3, 7-9, 21, 28 and 29 Mar. 1972
Avail: Comm. on Armed services
For abstract, see N72-28957.

N72-28959# Committee on Armed Services (U. S. Senate).
FISCAL YEAR 1973 AUTHORIZATION FOR MILITARY PROCUREMENT, RESEARCH AND DEVELOPMENT, CONSTRUCTION AUTHORIZATION FOR THE SAFEGUARD ABM, AND ACTIVE DUTY AND SELECTED RESERVE STRENGTHS. PART 5: RESEARCH AND DEVELOPMENT
Washington GPO 1972 1362 p refs Hearings on S. 3108 before Comm. on Armed Serv., 92d Congr, 2d Sess., 1-3, 6, 9, 10, 13, 15-17, 22, 23 Mar. and 5 Apr. 1972
Avail: Comm. on Armed services
For abstract, see N72-28957.

N72-28960# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne (West Germany).
REPORT ON THE DGLR-SYMPOSIUM PIONEERS OF SPACE FLIGHT [BERICHT UEBER DAS DGLR-SYMPOSIUM PIONIERE DER RAUMFAHRT]
Sep. 1971 104 p refs In GERMAN; ENGLISH Summary Symp. held at Stuttgart, 29 Apr. 1971
(DLR-Mitt-71-24) Avail: NTIS HC $7.25; ZLDI Munich: 21 DM

Lectures on ideas and activities of early pioneers of rocket and space technology are presented. Research and development work in manned space flight, interplanetary spacecraft, and spacecraft propulsion systems are highlighted. For individual titles, see N72-28961 through N72-28969.

N72-28961 Saenger-Bredt (I.), Stuttgart (West Germany).
INTRODUCTION: SOCIOLOGY OF THE PIONEER IN TECHNICAL SCIENCES [EINFUEHRUNG: ZUR SOZIOLOGIE DES PIONIERS DER TECHNISCHEN WISSENSCHAFTEN]
I. Saenger-Bredt *In* DGLR Report on the DGLR-Symp. Pioneers of Space Flight Sep. 1971 p 7-11 In GERMAN (For availability see N72-28960 19-34)

This brief history of space flight rocketry considers philosophers and inventors as the first generation of space flight pioneers, and engineers and natural scientists who translated these ideas into technical applications as the second generation of space flight pioneers. Contributions of the various pioneers to the development and realization of space flight are outlined and financial support is urged in order to preserve their writings and memorabilia. Transl. by G.G.

N72-28962 Fritz (A.), Stuttgart (West Germany).
HERMAN GANSWINDT AND THE EARLY DEVELOPMENT OF THE SPACESHIP IDEA [HERMANN GANSWINDT UND DIE FRUEHE ENTWICKLUNG DER RAUMSCHIFFI-DEE]
A. Fritz *In* DGLR Report on the DGLR-Symp. Pioneers of Space Flight Sep. 1971 p 12-18 In GERMAN (For availability see N72-28960 19-34)

The life histories of the inventors of a steerable dirigible and of a spherical space ship are presented together with outlines of early theoretical works that entertain the idea of space ships. Transl. by G.G.

N72-28963 Kowazenko (W.), Bonn (West Germany).
ZIOLKOWSKI AND OTHER EARLY RUSSIAN SPACE FLIGHT PIONEERS [ZIOLKOWSKI UND ANDERE FRUEHE RUSSISCHE RAUMFAHRTPIONIERE]
W. Kowazenko *In* DGLR Report on the DGLR-Symp. Pioneers of Space Flight Sep. 1971 p 19-28 In GERMAN (For availability see N72-28960 19-34)

Early Russian contributors to the development of rocket propulsion and manned spacecraft are named and some of their theoretical and experimental works on solid and liquid rocket propulsion systems are described. Transl. by G.G.

N72-28964 Waagner-Biro A.G., Vienna (Austria).
GUIDO VON PIRQUET: AN AUSTRIAN PIONEER OF SPACE FLIGHT [GUIDO VON PIRQUET, EIN OESTERREICHISCHER VORKAEMPFER FUER DIE RAUMFAHRT]
F. Sykora *In* DGLR Report on the DGLR-Symp. Pioneers of Space Flight Sep. 1971 p 29-39 refs In GERMAN (For availability see N72-28960 19-34)

The Austrian space flight pioneer calculated the first flight trajectories for lunar missions and proved the necessity to develop a space station for interplanetary manned space flight. Transl. by G.G.

N72-28965 Smithsonian Institution, Washington, D.C.
ROBERT H. GODDARD AND THE JAMES-SMITHSON FOUNDATION (SMITHSONIAN INSTITUTION) [ROBERT

H. GODDARD UND DIE JAMES-SMITHSON STIFTUNG (SMITHSONIAN INSTITUTION)]
F. C. Durant *In* DGLR Report on the DGLR-Symp. Pioneers of Space Flight Sep. 1971 p 40-50 refs In GERMAN (For availability see N72-28960 19-34)

Details of the 29-year long cooperation between the Smithsonian Institution and the physicist Goddard are discussed. The financial support of the Institution in the development of an upper atmosphere rocket for aerial photography as well as for long range rocket propulsion systems is outlined. Transl. by G.G.

N72-28966 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).
THE ROCKET PIONEER FRIEDRICH WILHELM SANDER [DER RAKETENPIONIER FRIEDRICH WILHELM SANDER]
F. Alber *In* DGLR Report on the DGLR-Symp. Pioneers of Space Flight Sep. 1971 p 51-54 In GERMAN (For availability see N72-28960 19-34)

Original experiments with liquid propelled rocket engines are attributed to this space flight pioneer. Also illustrated are the development of a rocket driven racing car with electrical ignition and the production of rocket engines for aircrafts.

Transl. by G.G.

N72-28967 Roth-Oberth (E.), Feucht (West Germany).
HERMAN OBERTH'S WORK FOR SPACE FLIGHT [HERMAN OBERTHS WIRKEN FUER DIE RAUMFAHRT]
E. Roth-Oberth *In* DGLR Report on the DGLR-Symp. Pioneers of Space Flight Sep. 1971 p 55-60 In GERMAN (For availability see N72-28960 19-34)

Calculations, construction drawings, and experiments by Oberth were directed towards the development of liquid propellant systems for spacecraft. Invention highlights constitute a velocity multiplier, an electrically powered spacecraft, a space mirror, and the conical nozzle for liquid propellant combustion.

Transl. by G.G.

N72-28968 Essers (I), Aachen (West Germany).
THE IMPORTANCE OF MAX VALIERS IN THE DEVELOPMENT OF ROCKET TECHNOLOGY AND SPACE FLIGHT [DIE BEDEUTUNG MAX VALIERS FUER DIE ENTWICKLUNG VON RAKETENTECHNIK UND RAUMFAHRT]
I. Essers *In* DGLR Report on the DGLR-Symp. Pioneers of Space Flight Sep. 1971 p 61-73 In GERMAN (For availability see N72-28960 19-34)

The invention and development of liquid propellant rocket engines using the retrojet principle are described and experiments with racing cars, sleds, and liquid oxygen combustion chambers are reported. Transl. by G.G.

N72-28969 Saenger-Bredt (I.), Stuttgart (West Germany).
CONTRIBUTIONS OF EUGEN SAENGER TO THE DEVELOPMENT OF SPACE FLIGHT TECHNOLOGY [BEITRAEGE EUGEN SAENGERS ZUR ENTWICKLUNG DER RAUMFAHRTTECHNIK]
I. Saenger-Bredt *In* DGLR Report on the DGLR-Symp. Pioneers of Space Flight Sep. 1971 p 74-98 refs In GERMAN (For availability see N72-28960 19-34)

Basic manned spacecraft concepts envisioned by this pioneer related to a space station module, a space tug, the space shuttle, and thermonuclear spacecraft propulsion systems. Combustion studies brought patents on a regenerative forced cooling system for propulsion and expansion nozzles as well as basic theoretical calculations on fuel injection into rocket motors, the use of air-fuel mixtures for increased thrust, photon propulsion systems, horizontal rocket starts, etc. Transl. by G.G.

N72-28970*# George Washington Univ., Washington, D.C.
DESIGN EVALUATION IN TECHNOLOGY ASSESSMENT: ILLUSTRATED BY AUDITORY IMPEDANCE AND SOUND DISTRIBUTION PROBLEMS
John F. Halldane 9 Mar. 1972 51 p refs Presented at Seminar No. 2 of an Evening Ser. on Technol. Assessment Methodology, Washington, D. C., 9 Mar. 1972
(Grant NGL-09-010-030)
(NASA-CR-127478; GWPS-MON-12) Avail: NTIS CH $4.75 CSCL 05K

Technology is considered as a culture for changing a physical world and technology assessment questions the inherent cultural capability to modify power and material in support of living organisms. A comprehensive goal-parameter-synthesis-criterion specification is presented as a basis for a rational assessment of technology. The thesis queries the purpose of the assessed problems, the factors considered, the relationships between factors, and the values assigned those factors to accomplish the appropriate purpose. Stationary and sequential evaluation of enviro-organismic systems are delegated to the responsible personalities involved in design; from promoter/designer through contractor to occupant. Discussion includes design goals derived from organismic factors, definitions of human responses which establish viable criteria and relevant correlation models, linking stimulus parameters, and parallel problem-discipline centered design organization. A consistent concept of impedance, as a degradation in the performance of a specified parameter, is introduced to overcome the arbitrary inoperative connotations of terms like noise, discomfort, and glare. Applications of the evaluative specification are illustrated through design problems related to auditory impedance and sound distribution. Author

N72-28971*# Pittsburgh Univ., Pa.
WHAT IS KASC ?
[1972] 12 p refs Sponsored by NASA
(NASA-CR-127472) Avail: NTIS HC $3.00 CSCL 05B

The organization and functions of the Knowledge Availability System Center are discussed. The KASC is defined as a nonprofit, computerized information center at the University of Pittsburgh. The KASC provides literature searching and referral services designed to identify useful scientific and technical data to its clients. Two types of service are provided: (1) the retrospective search, in which entire reference files are searched, and (2) the current awareness service which provides information on new developments and work being done in related fields. It is stated that the services provided by KASC will reduce duplication of expensive research and aid the movement of new knowledge across industrial, regional, and disciplinary boundaries. Author

N72-28972*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
PROCUREMENT SPECIFICATIONS REPORT. IMBLS PHASE B-4
9 Dec. 1970 100 p
(Contract NAS9-10742)
(NASA-CR-115720; LMSC-A977461) Avail: NTIS HC $7.00 CSCL 05C

Procurement specifications to provide vendors of space systems with supporting information to accurately price the selected major buy items are illustrated. In performing this task, rigid constraints on specifications and drawing details are avoided beyond those necessary to define basic requirements. Described are digital processing equipment, mass spectrometer, body mass measuring device, sensors, bio-belt power source, vision tester and instrumentation for a biochemical station. G.G.

N72-28973# Naval Research Lab., Washington, D.C.
NRL PROGRESS REPORT, JUNE 1972
William M. Leak, ed. and Daniel R. Nelson, ed. Jun. 1972 43 p refs
Avail: NTIS HC $4.25

When laser radiation interacts with a metallic system, the initial coupling efficiency is given by the absorptivity of the metal. By using the free-electron theory of the optical properties of metals, the absorptivity in the infrared of various aerospace metals and alloys was calculated. Free-electron theory predicts

that the absorptivity is determined by only three parameters: the electrical conductivity, the ratio of the effective mass to the carrier concentration, and the wavelength of the radiation. The temperature dependence of the absorptivity was obtained from the variation of the electrical conductivity with temperature. The results of these calculations at two laser wavelengths were compared with the available experimental data, and reasonably good agreement was obtained for the noble metals. Progress notes are also presented on acoustics, electronics, metallurgy, ocean sciences, ocean technology, solid state physics, and space sciences. Author

N72-28974# National Bureau of Standards, Washington, D.C. Office of International Relations.
NBS SPECIAL FOREIGN CURRENCY PROGRAM IN ISRAEL, 1970 - 1971
H. Steffen Peiser and Max Klein Apr. 1972 179 p refs
(NBS-TN-721) Avail: SOD $1.50 as C13.46:721

Summaries of research performed under grants awarded by NBS are presented in a form useful for evaluating the binational cooperative scientific program. The projects reported are geared mainly toward improved scientific and technical measurements and more effective use of science and technology. Calibrating techniques, development of standards, measurements on materials, materials science, building technology, computerized data processing, and information reference services are covered. N.E.N.

N72-28975# Committee on Interstate and Foreign Commerce (U. S. House).
NOISE CONTROL ACT OF 1972
Staggers 19 Feb. 1972 39 p refs Rept. to accompany H.R. 11021 presented by the Comm. on Interstate and Foreign Com. to the Comm. of the Whole House on the State of the Union, 92d Congr., 2d Sess., 19 Feb. 1972
(H-Rept-92-842) Avail: US Capitol, House Document Room

The Committee on Interstate and Foreign Commerce presents an amendment to a proposed bill to control the emission of noise detrimental to the human environment. Considered is the nature and extent of noise as an element of environmental concern; the adequacy of technology to deal with the problem of noise abatement; the extent and effectiveness of present Federal programs for noise control and the cost of noise control; the responsibility of the Federal Government, the States and their political subdivisions in abating and controlling noise; and the proper roles of the Environmental Protection Agency and the Federal Aviation Administration with respect to aircraft noise. G.G.

N72-28976# National Business Aircraft Association, Inc., Washington, D.C.
FAA PLANNING REVIEW CONFERENCE PRESENTATION "PRIORITIES AND INVESTMENTS" PROGRAM
John A. Pope 27 Apr. 1971 10 p
Avail: NTIS HC $3.00

The present and projected airport requirements for the corporate/executive/business aircraft users are discussed. The business aircraft operators agree with the FAA in requiring ILS installation and control tower at more small airports. The business aircraft operators wish to be separated from all other general aviation operations and to have access to the system and metropolitan hub airports, with improved landside passenger service. Reliever airports in metropolitan areas should have good traffic flow to and from the airports, good surface conditions and facilities, and good surface transportation facilities. It is pointed out that business aircraft operations extend to thousands of airports while the airlines serve only approximately 525 points. It is felt that an established program for improvement of these airports in less populous areas is needed, along with the acquisition of valid data on airport use, passenger enplanements, numbers and types of aircraft, and related information. N.E.N.

N72-28977# RAND Corp., Santa Monica, Calif.
USING LOGISTICS MODELS IN SYSTEM DESIGN AND EARLY SUPPORT PLANNING
R. M. Paulson, R. B. Waina, and L. H. Zacks Feb. 1971 138 p refs
(Contract F44620-67-C-0045; Proj. RAND)
(AD-724690; R-550-PR) Avail: NTIS HC $9.00 CSCL 05/1

Available modeling techniques are described that can be used during weapon system conception, development, production, and deployment to investigate the logistics impacts of system design and operational decisions. Some of the techniques and models to assist in the development tradeoff processes are analyzed, with a primary orientation toward techniques that emphasize early support planning and integrated logistics concepts. Strategies for using such models are discussed. The analysis is addressed to system designers, system development program managers, logistics planners, and staff planners responsible for implementing integrated logistics support (ILS) concepts, and the study is designed to clarify how some of the ILS tasks may be performed. Methods for developing estimates of support costs are considered. Author

N72-28978# Speas (R. Dixon) Associates, Manhasset, N.Y.
AIRPORT AND AIRSPACE CAPACITY ANALYSIS: SUPPLEMENTAL REPORT, PHASE 2
Sep. 1971 96 p refs Sponsored in part by the Dept. of Housing and Urban Development
Avail: NTIS HC $7.00

An analysis is presented of the airport air traffic capacity of several preliminary airport system alternatives to meet the 1985 San Francisco Bay area demand forecast of 83.5 million annual passengers. Aviation facilities include both airports and transitional airspace. Airline and general aviation traffic is included along with military traffic to the extent that it affects the capacity of civil facilities. Airport capacity is computed for individual airports, and the interrelation between airports is considered. Each of the eleven airport systems was found to be quantitatively capable of meeting its required air carrier demand. Residual capacity for general aviation is indicated where required, after forecast air carrier demand is satisfied. The effect each airport system would have upon transition and enroute airspace is also evaluated. Author

N72-28979# Department of Transportation, Washington, D.C.
COMMUTER AIR CARRIERS
May 1972 75 p
Avail: NTIS HC $5.75

The usefulness and importance of commuter air carriers are discussed; it was found that 80 percent of their passengers connect with major airlines. Commuter carriers operate successfully without Federal regulation of rates and routes and Federal subsidies. The utilization of higher capacity aircraft for commuter service is being considered by the Civil Aeronautics Board. The commuter airline industry's history, Federal policies and programs, and regulatory problems are also presented. J.A.M.

N72-28980*# National Aeronautics and Space Administration, Washington, D.C.
ADVANCED TECHNOLOGY AND EUROPEAN UNITY
R. Bloch Jul. 1972 18 p Transl. into ENGLISH from l'Aeronautique et l'Astronautique (Paris), no. 35, 1972 p 5-11
(NASA-TT-F-14354) Avail: NTIS HC $3.00 CSCL 05B

During the first forty years of the Twentieth Century, great scientific discoveries were still chiefly European; but in the last twenty-five years, nearly all discoveries are coming from the United States of America. Creative power remains a necessity of human progress; but personal genius, unless associated with a well structured modern organization, is no longer sufficient to fully develop practical invention. The present superiority of our American friends, and our Soviet neighbor's potential development, challenge the ability to materialize European ideas. Thanks to the gradual awakening of some European conscience successful

cooperation will substantially promote European progress.
Author

N72-28981# Federal Aviation Administration, Washington, D.C. Office of Aviation Economics.
AIRPORT RANKING OF AIR CARRIER PASSENGER ENPLANEMENTS FISCAL YEAR 1971
Feb. 1972 7 p
Avail: NTIS

Data are provided for Fiscal Year 1971 on total air carrier passenger enplanements at all airports boarding more than 100,000 passengers within the 50 states of the United States, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands. The data cover all domestic and international passengers enplaned by United States certificated route, foreign flag, supplemental and intrastate air carriers. Author

N72-28982# Federal Aviation Administration, Washington, D.C Office of Aviation Policy and Plans.
PASSENGER UTILIZATION OF FAA FACILITIES
Jul. 1972 11 p
(AV-72-1) Avail: NTIS HC $3.00

An analysis of airport facilities is presented, showing that major portions of airports are not equipped with towers, radar, and instrument landing system. The concentration of passengers was found to benefit from FAA services at large air traffic airports. Percentage distributions of passenger enplanements for commissioned and programmed facilities are also given in tabular form. J.S.M.

N72-28983# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
PREPARATION AND CALIBRATION OF STANDARDS OF SPECTRAL SPECULAR REFLECTANCE
J. C. Richmond and J. J. Hsia May 1972 60 p refs
(NBS-SP-260-38; LC-72-600063) Avail: SOD $0.60 as C13.10:260-38

The preparation and calibration of Standard Reference Materials 2001 through 2008 are described in detail. These standards of spectral specular reflectance were prepared commercially by vacuum depositing opaque coatings of gold and aluminum, respectively, onto polished substrates of fine-annealed borosilicate glass. The near-normal (9 deg from normal) spectral specular reflectance was measured by the multiple-reflection technique. Four different combinations of source, spectrometer, and detector were used to cover the wavelength range from about 0.25 micrometers to 30 micrometers and beyond. Author

N72-28984*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
THE LUNAR SCIENCES NATURAL LANGUAGE INFORMATION SYSTEM Final Report
W. A. Woods, R. M. Kaplan, and B. Nash-Webber 15 Jun. 1972 394 p refs Prepared in cooperation with Language Research Foundation, Cambridge, Mass.
(Contract NAS9-1115)
(NASA-CR-127723; BBN-2378) Avail: NTIS HC $21.75 CSCL 05B

The current state is reported of a two-year research project aimed toward the development of a prototype natural language question-answering system for lunar geologists. The project has made considerable progress toward the ultimate goal of providing a general purpose natural language interface between men and machines. The Lunar Sciences Natural Language Information System is the result of these two years of effort. It is an experimental, research prototype of a question-answering system to enable a lunar geologist to conveniently access, compare, and evaluate the chemical analysis data on lunar rock and soil composition that is accumulating as a result of the Apollo moon missions. The objective of the research has been to develop a natural language understanding facility sufficiently natural and complete that the task of selecting the wording for a complex request becomes a negligible effort for the geologist user. A brief users manual and a collection of examples of the system's performance are included as well as complete listings of grammar and semantic rules and detailed system documentation.
Author

N72-28985# Department of Transportation, Washington, D.C.
CARGO SECURITY EQUIPMENT APPLICATIONS GUIDE Report of the Technical Coordination Subcommittee
1 Jun. 1972 79 p Prepared for Interagency Comm. on Transportation Security with the assistance of MITRE Corp.
Avail: NTIS HC $6.00

Research and development efforts by DOT to assist civil aviation security programs are outlined. Particular attention was given to cargo security. An inventory was made of off-the-shelf equipment available for immediate use, and recommendations for the solution of common security problems using this equipment are given. Data cover physical protection, detection of theft or intrusion, and effective response to such problems. E.H.W.

N72-28986# Federal Aviation Administration, Washington, D.C.
A SELECTED, ANNOTATED BIBLIOGRAPHY RELATED TO AVIATION'S RESPONSES TOWARD IMPROVING THE ENVIRONMENT
Nov. 1971 21 p refs
(GA-300-89) Avail: NTIS HC $3.25

A brief bibliography is presented in an effort to counteract some of the negativism found in print about aircraft environment pollution. Data given here cover a partial list of magazine articles, leaflets, booklets, speeches, and congressional testimony on the environmental problem solving efforts of the industry.
Author

N72-28987*# National Aeronautics and Space Administration, Washington, D.C.
NASA WORK UNIT SYSTEM FILE MAINTENANCE MANUAL
Aug. 1972 51 p
(NASA-TM-X-2608) Avail: NTIS HC $3.00 CSCL 05B

The NASA Work Unit System is a management information system for research tasks (i.e., work units) performed under NASA grants and contracts. It supplies profiles on research efforts and statistics on fund distribution. The file maintenance operator can add, delete and change records at a remote terminal or can submit punched cards to the computer room for batch update. The system is designed for file maintenance by a person with little or no knowledge of data processing techniques.
Author

N72-28988*# National Aeronautics and Space Administration, Washington, D.C.
NASA WORK UNIT SYSTEM USERS MANUAL
Aug. 1972 62 p
(NASA-TM-X-2609) Avail: NTIS HC $3.00 CSCL 05A

The NASA Work Unit System is a management information system for research tasks (i.e., work units) performed under NASA grants and contracts. It supplies profiles to indicate how much effort is being expended to what types of research, where the effort is being expended, and how funds are being distributed. The user obtains information by entering requests on the keyboard of a time-sharing terminal. Responses are received as video displays or typed messages at the terminal, or as lists printed in the computer room for subsequent delivery by messenger.
Author

N72-28989# Army Foreign Science and Technology Center, Charlottesville, Va.
ANTIAIRCRAFT DEFENSE HERALD. NUMBER 5, MAY 1971
3 Jan. 1972 188 p Transl. into ENGLISH of Vestn. Protivovozdushnoi Oborony (Moscow), No. 5, May 1971

(AD-739972; FSTC-HT-23-902-72) Avail: NTIS CSCL 15/3

Contents: Combat readiness, Air tactical exercises, Teamwork, Military training, Technical inspection quality, Noise control, Computer programming, Optical ranging, Winged rocket countermeasures, Military psychology. GRA

N72-28990# RAND Corp., Santa Monica, Calif.

LOGISTICS AND TECHNOLOGY: SOME THOUGHTS ABOUT FUTURE MILITARY IMPLICATIONS

Robert M. Paulson and Thomas T. Tierney Mar. 1971 14 p ref

(AD-738045; P-4597) Avail: NTIS CSCL 15/5

The impact of new technology in terms of future military operations is discussed. Two approaches are considered for assessing the impact of new technology on logistics: (1) the voluntary accomodation of technology to facilitate logistic processes and (2) the forced response of the logistics system to support the new technology. Examples of the first case are examined for higher speed communications, improved packaging techniques, comprehensive information systems, and improved material handling equipment. Examples of the second case are telemechanisms, space systems, and laser devices. Author

N72-28991# Office of Naval Research, London (England).

EUROPEAN SCIENTIFIC NOTES, VOLUME 26, NUMBER 2

Seymour L. Hess and Victoria Hewitson 29 Feb. 1972 42 p refs

(AD-738810; ONR-26-2) Avail: NTIS CSCL 14/2

The monthly publication presents brief articles concerning recent developments in European scientific research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by disclosing interesting information in advance of the usual scientific publications. GRA

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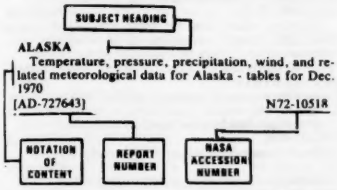
TYPICAL SUBJECT INDEX LISTING



The subject heading is a key to the subject content of the document. The Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The NOC's are arranged under each subject heading in ascending accession number order.

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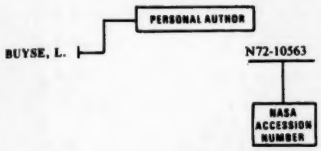

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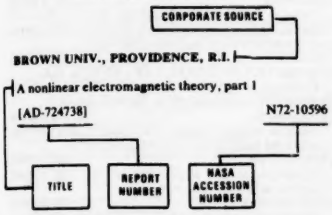

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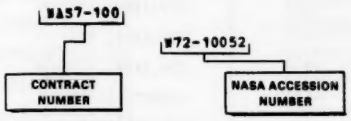

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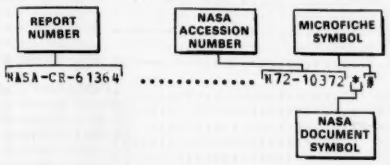

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NASA-CR-127703 ..... N72-28706*#
NASA-CR-127704 ..... N72-28320*#
NASA-CR-127705 ..... N72-28202*#
NASA-CR-127722 ..... N72-28925*#
NASA-CR-127723 ..... N72-28984*#
NASA-CR-127726 ..... N72-28'96*#

NASA-SER-H-1011 ..... N72-28874*#
NASA-SER-H-1013 ..... N72-28875*#
NASA-SER-H-1017 ..... N72-28875*#

NASA-SER-S-0076 ..... N72-28873*#

NASA-SP-5109 ..... N72-28566*#
NASA-SP-7011(98) ..... N72-28032*+
NASA-SP-7037(14) ..... N72-27993*+
NASA-SP-7037(18) ..... N72-27992*+

NASA-TM-X-2410 ..... N72-28818*#
NASA-TM-X-2586 ..... N72-28685*#
NASA-TM-X-2591 ..... N72-28259*#
NASA-TM-X-2592 ..... N72-28890*#
NASA-TM-X-2594 ..... N72-27994*#
NASA-TM-X-2595 ..... N72-28919*#
NASA-TM-X-2597 ..... N72-28173*#
NASA-TM-X-2600 ..... N72-28009*#
NASA-TM-X-2604 ..... N72-28134*#
NASA-TM-X-2605 ..... N72-28295*#
NASA-TM-X-2606 ..... N72-28747*#
NASA-TM-X-2608 ..... N72-28987*#
NASA-TM-X-2609 ..... N72-28988*#
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NASA-TM-X-68107 ..... N72-28288*#

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NASA-TM-X-68114 ..... N72-28882*#
NASA-TM-X-68115 ..... N72-28795*#
NASA-TM-X-68116 ..... N72-28920*#
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NASA-TM-X-68118 ..... N72-28505*#
NASA-TM-X-68122 ..... N72-28879*#
NASA-TM-X-68391 ..... N72-28226*#
NASA-TM-X-68392 ..... N72-28869*
NASA-TM-X-68394 ..... N72-28832*#
NASA-TM-X-68668 ..... N72-28143*#
NASA-TM-X-68669 ..... N72-28318*#
NASA-TM-X-68684 ..... N72-28204*#
NASA-TM-X-68688 ..... N72-28574*#
NASA-TM-X-68689 ..... N72-28573*#
NASA-TM-X-68690 ..... N72-28230*#
NASA-TM-X-68691 ..... N72-28818*#

NASA-TN-D-6277 ..... N72-28345*#
NASA-TN-D-6519 ..... N72-28546*#
NASA-TN-D-6813 ..... N72-28006*#
NASA-TN-D-6815 ..... N72-28454*#
NASA-TN-D-6819 ..... N72-28728*#
NASA-TN-D-6842 ..... N72-28544*#
NASA-TN-D-6859 ..... N72-28884*#
NASA-TN-D-6862 ..... N72-28922*#
NASA-TN-D-6868 ..... N72-28830*#
NASA-TN-D-6875 ..... N72-28928*#
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NASA-TN-D-6879 ..... N72-28455*#
NASA-TN-D-6882 ..... N72-28474*#
NASA-TN-D-6889 ..... N72-28697*#
NASA-TN-D-6891 ..... N72-28543*#
NASA-TN-D-6892 ..... N72-28572*#
NASA-TN-D-6900 ..... N72-28015*#
NASA-TN-D-6902 ..... N72-28294*#
NASA-TN-D-6903 ..... N72-28145*#
NASA-TN-D-6906 ..... N72-28020*#
NASA-TN-D-6919 ..... N72-27998*#

NASA-TR-R-389 ..... N72-28854*#

NASA-TR-72-2 ..... N72-28571*#
NASA-TR-72-5 ..... N72-28906*#

NASA-TT-F-14158 ..... N72-28567*#
NASA-TT-F-14179 ..... N72-28825*#
NASA-TT-F-14281 ..... N72-28001*#
NASA-TT-F-14282 ..... N72-28000*#
NASA-TT-F-14287 ..... N72-28336*#
NASA-TT-F-14301 ..... N72-28826*#
NASA-TT-F-14303 ..... N72-28131*#
NASA-TT-F-14305 ..... N72-28784*#
NASA-TT-F-14308 ..... N72-28046*#
NASA-TT-F-14313 ..... N72-28872*#
NASA-TT-F-14327 ..... N72-28766*#
NASA-TT-F-14331 ..... N72-28833*#
NASA-TT-F-14340 ..... N72-28748*#
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NASA-TT-F-14347 ..... N72-28810*#
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NASA-TT-F-14364 ..... N72-28356*#
NASA-TT-F-14366 ..... N72-28290*#
NASA-TT-F-14372 ..... N72-28723*#
NASA-TT-F-14373 ..... N72-28291*#
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NASA-TT-F-14404 ..... N72-28133*#
NASA-TT-F-14411 ..... N72-28138*#
NASA-TT-F-14412 ..... N72-28042*#
NASA-TT-F-14506 ..... N72-28136*#
NASA-TT-F-14514 ..... N72-28846*#

NASA-TT-F-14516 ..... N72-28351*#
NASA-TT-F-14526 ..... N72-28883*#
NASA-TT-F-14533 ..... N72-28842*#

NAVMED-MF12.524.004-7007D-1 ..... N72-28082 #

NAVMED-MR011.01-5033-01 ..... N72-28074 #

NBS-BSS-43 ..... N72-28900 #

NBS-HANDBOOK-105-1-REV ..... N72-28500 #

NBS-SP-260-38 ..... N72-28983 #
NBS-SP-260-39 ..... N72-28539 #

NBS-TN-534 ..... N72-28368 #
NBS-TN-617 ..... N72-28917*#
NBS-TN-721 ..... N72-28974 #
NBS-TN-734 ..... N72-28201 #

NBS-10-837 ..... N72-28673 #
NBS-9799 ..... N72-28537*#

NCAR-TN/EDD-74 ..... N72-28675 #
NCAR-TN/STR-72 ..... N72-28640 #
NCAR-TN/STR-73 ..... N72-28641 #
NCAR-TN/STR-75 ..... N72-28642 #

NCEL-TN-1208 ..... N72-28269 #
NCEL-TN-1214 ..... N72-28268 #
NCEL-TN-1215 ..... N72-28267 #
NCEL-TN-1217 ..... N72-28270 #
NCEL-TN-1218 ..... N72-28266 #
NCEL-TN-1219 ..... N72-28265 #

NEN-3005 ..... N72-28275

NIH-69-2241-1 ..... N72-28110 #

NLL-AR-TRASN-591-(9022.823) N72-28224

NLL-CE-TRANS-5752-(9022.09) N72-28893
NLL-CE-TRANS-5827-(9022.09) N72-28127
NLL-CE-TRANS-5828-(9022.09) N72-28680

NLL-CTO-771-(9091.9F) N72-28736
NLL-CTO-775-(9091.9F) N72-28741
NLL-CTO-778-(9091.9F) N72-28740
NLL-CTO-779-(9091.9F) N72-28738
NLL-CTO-783-(9091.9F) N72-28739
NLL-CTO-784-(9091.9F) N72-28737
NLL-CTO-808-(9091.9F) N72-28742

NLL-DRIC-TRANS-2580-(3623.66) N72-28031

NLL-LTI-746-1062-(9022.401) N72-28533

NLL-M-20984-(5828.4F) N72-28275
NLL-M-21235-(5828.4F) N72-28530
NLL-M-21253-(5828.4F) N72-28528
NLL-M-21254-(5828.4F) N72-28529
NLL-M-21319-(5828.4F) N72-28485
NLL-M-22068-(5828.4F) N72-28609
NLL-M-22087-(5828.4F) N72-28610
NLL-M-22248-(5828.4F) N72-28561
NLL-M-22253-(5828.4F) N72-28560
NLL-M-22287-(5828.4F) N72-28276
NLL-M-22302-(5828.4F) N72-28622
NLL-M-22322-(5828.4F) N72-28584
NLL-M-22324-(5828.4F) N72-28583
NLL-M-22335-(5828.4F) N72-28613
NLL-M-22340-(5828.4F) N72-28614
NLL-M-22355-(5828.4F) N72-28661
NLL-M-22356-(5828.4F) N72-28612
NLL-M-22358-(5828.4F) N72-28611
NLL-M-22376-(5828.4F) N72-28486
NLL-M-22385-(5828.4F) N72-28623
NLL-M-22391-(5828.4F) N72-28624
NLL-M-22438-(5828.4F) N72-28304
NLL-M-22456-(5828.4F) N72-28305

NLL-RISLEY-TR-2238-(9091.9F) N72-28483
NLL-RISLEY-TR-2297-(9091.9F) N72-28126
NLL-RISLEY-TR-2340-(9091.9F) N72-28484
NLL-RISLEY-TR-2350-(9091.9F) N72-28487
NLL-RISLEY-TR-2361-(9091.9F) N72-28493

NLL-RTS-6656 ..... N72-28235
NLL-RTS-6784 ..... N72-28125
NLL-RTS-6880 ..... N72-28124
NLL-RTS-6933 ..... N72-28030
NLL-RTS-6996 ..... N72-28129
NLL-RTS-7064 ..... N72-28128
NLL-RTS-7141 ..... N72-28492
NLL-RTS-7157 ..... N72-28491
NLL-RTS-7187 ..... N72-28690
NLL-RTS-7326 ..... N72-28912

NLL-SMRE-TRANS-5964-(8313.4) N72-28691
NLL-SMRE-TRANS-6049-(8313.4) N72-28302

NLL-TRANS-746-1074-(9022.401) N72-28488
NLL-TRANS-746-1111-(9022.401) N72-28520
NLL-TRANS-746-1114-(9022.401) N72-28562
NLL-TRANS-746-1115-(9022.401) N72-28532
NLL-TRANS-746-1127 ..... N72-28760
NLL-TRANS-746-1130-(9022.401) N72-28489
NLL-TRANS-746-1131-(9022.401) N72-28531
NLL-TRANS-746-1158-(9022.401) N72-28490
NLL-TRANS-746-1182-(9022.401) N72-28434
NLL-TRANS-746-1189-(9022.401) N72-28534
NLL-TRANS-849-(9022.64) N72-28494
NLL-TRANS-2759-(9022.81) N72-28236
NLL-TRANS-2793-(9022.81) N72-28239
NLL-TRANS-2799-(9022.81) N72-28238
NLL-TRANS-2830-(9022.81) N72-28194
NLL-TRANS-2837-(9022.81) N72-28303
NLL-TRANS-2846-(9022.81) N72-28237

NLL-102-(8660.5) N72-28563

NOAA-AWS-TR-212 ..... N72-28658 #

NOAA-TR-ERL-212-WPL-16 ..... N72-28369 #

NOTA-INTERNA-326 ..... N72-28734 #
NOTA-INTERNA-347 ..... N72-28709 #

NPL-MAR-SCI-5-72 ..... N72-27996 #

NRC-TT-1557 ..... N72-28904 #
NRC-TT-1563 ..... N72-28510 #
NRC-TT-1565 ..... N72-28703 #
NRC-TT-1566 ..... N72-28140 #
NRC-TT-1567 ..... N72-28139 #

NRL-MR-2400 ..... N72-28862 #
NRL-MR-2466 ..... N72-28506*#

NRL-7356 ..... N72-28207 #

NSMRL-675 ..... N72-28074 #

NTSB-BA-72-1 ..... N72-28016 #

NUSC-TM-RA321-4010-72 ..... N72-28596 #

NWC-TP-5330 ..... N72-28925*#

OCEANOG-47 ..... N72-28403 #

ONERA-TP-1061 ..... N72-28156 #
ONERA-TP-1067 ..... N72-28916 #
ONERA-TP-1101 ..... N72-28790 #

ONR-DR-153 ..... N72-28041*#
ONR-26-2 ..... N72-28991 #

ONRL-C-5-72 ..... N72-28085 #

ORNL-TM-3654 ..... N72-28261 #
ORNL-TM-3731 ..... N72-28756 #
ORNL-TM-3740 ..... N72-28476 #

ORNL-TR-2579 ..... N72-28549 #

ORNL-4698 ..... N72-28711*#

ORO-4076-1 ..... N72-28514 #

OSU-PP-111 ..... N72-28517 #

OSW-RDPR-72-741 ..... N72-28554 #

OT/TRER-24 ..... N72-28161 #

P-832 ..... N72-28301 #
P-4597 ..... N72-28990 #

PA-TR-4279-PT-3 ..... N72-28582 #
PA-TR-4330 ..... N72-28607 #

PB-206686 ..... N72-28772 #
PB-207191 ..... N72-28401 #
PB-207523 ..... N72-28400 #
PB-207593 ..... N72-28399 #
PB-207700 ..... N72-28660 #
PB-207712 ..... N72-28110 #
PB-207788 ..... N72-28300 #
PB-207811 ..... N72-28556 #
PB-208029 ..... N72-28151 #
PB-208059 ..... N72-28554 #
PB-208064 ..... N72-28404 #
PB-208156 ..... N72-28403 #
PB-208235 ..... N72-28402 #
PB-208271 ..... N72-28555 #
PB-208274 ..... N72-28551 #
PB-208277 ..... N72-28482 #
PB-208283 ..... N72-28423 #

PQ-7 ..... N72-28057*#

PR-1 ..... N72-28263 #
PR-1 ..... N72-28309*#
PR-1 ..... N72-28311*#
PR-1 ..... N72-28316*#
PR-73 ..... N72-28810*#
PR-84 ..... N72-28011*#
PR-86 ..... N72-28723*#
PR-87 ..... N72-28808*#
PR-90 ..... N72-28809*#
PR-188 ..... N72-28834*#

PRC-R-1459 ..... N72-28513*#

PRL-189-VOL-1 ..... N72-28091*#
PRL-189-VOL-2-PT-1 ..... N72-28092*#
PRL-189-VOL-2-PT-2 ..... N72-28093*#

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PWA-FR-5028 ..... N72-28796*#

PWA-4372 ..... N72-28518 #
PWA-4449 ..... N72-28786*#

QPR-3 ..... N72-28197*#
QPR-19 ..... N72-28821*#

QR-1 ..... N72-28026 #
QR-1 ..... N72-28045*#
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QR-2-PT-2 ..... N72-28615
QR-2-PT-2 ..... N72-28618
QR-3-PT-3 ..... N72-28621
QR-4-PT-4 ..... N72-28631

R-550-PR ..... N72-28977 #
R-553 ..... N72-28775 #
R-877-ARPA ..... N72-28652 #
R-908-ARPA ..... N72-28651 #

RADC-TR-71-319 ..... N72-28779 #
RADC-TR-71-320 ..... N72-28255 #
RAE-LIB-TRANS-1598 ..... N72-28472 #
RAE-LIB-TRANS-1638 ..... N72-28175 #
RAE-LIB-TRANS-1649 ..... N72-28062 #
RAE-LIB-TRANS-1651 ..... N72-28109 #

RAE-TR-70068 ..... N72-28475 #

RASA-72-01 ..... N72-27999*#

RDCGA-28-1 ..... N72-28433 #

RE-432J ..... N72-28807 #
RE-433 ..... N72-28851 #
RE-434J ..... N72-28814 #
RE-436 ..... N72-28297 #

REPT-0-5511-356-3 ..... N72-28080 #
REPT-1 ..... N72-28845*#
REPT-4/71 ..... N72-28478 #
REPT-5-2581-HOU-090 ..... N72-28855*#
REPT-5-2581-HOU-093 ..... N72-28663*#
REPT-6/71 ..... N72-28929 #
REPT-9G-88F ..... N72-28638*#

REPT-00.1481 ..... N72-28888*#
REPT-03-72-27 ..... N72-28246*#
REPT-11 ..... N72-28176 #
REPT-50 ..... N72-28937 #
REPT-54 ..... N72-28293 #
REPT-71-466-04 ..... N72-28924 #
REPT-71DBF017(E) ..... N72-28262 #
REPT-72-2 ..... N72-28405 #
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REPT-1917-MP1 ..... N72-28789*#
REPT-3030-2 ..... N72-28158*#
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REPT-8586-950001A-VOL-1 ..... N72-28090*#
REPT-18425.007 ..... N72-28660 #

RG-TR-72-4 ..... N72-28863 #

RM-546 ..... N72-28701 #
RM-549 ..... N72-28575 #
RM-551 ..... N72-28298 #

RR-TR-71-15 ..... N72-28152 #

RR-44 ..... N72-28151 #
RR-720 ..... N72-28770 #
RR-722 ..... N72-28693 #
RR-723 ..... N72-28745 #
RR-724 ..... N72-28713 #

RRC-B190 ..... N72-28338 #
RRC-B191 ..... N72-28337 #

RTCA-SC-115 ..... N72-28229 #

RTRC-A185 ..... N72-28331 #

R71AEG309 ..... N72-28793*#

S-382 ..... N72-28211 #
S-382-APP-B ..... N72-28216 #
S-382-APP-C ..... N72-28217 #
S-382-APP-D ..... N72-28218 #
S-382-APP-E ..... N72-28219 #
S-382-APP-F ..... N72-28220 #
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